Chapter One

Introduction

1.1 Introduction:

Mass general term that takes space in body, for neutral clinical use ("patient has a 5cm mass in the head of the pancreas seen on CT scan"), doesn't have to be neoplastic, may be mass due to reactive hyperplasia, infectious process...etc. Tumor a mass that is considered neoplastic (abnormal growth of cells), malignant or benign. (I.e. Fibroid - 'leiomyoma' is a uterine tumor but is benign). Cancer or malignant tumor is a term for diseases in which abnormal cells divide without control and can invade nearby tissues. Cancer cells can also spread to other parts of the body through the blood and lymph systems.). (Son 2016; Richarison 2011)

Mohammed (2014) mention that Cancer is an abnormal growth of cell. Cancer cells can differentiated from the other healthy cells in being different in shape, improper function and capacity to spread to other parts of the body. The study of cancer and tumors called Oncology. Cancer is no single disease but is a group of diseases.

One of the most important issues that facing human kind now adages is the threaten diseases that attack human body systems mainly cancer diseases, In our interested topic is the frequency of cancer, the information will collected from statistic to seek general information about cancer epidemiology and most common type frequency in Radiation and Isotopes Center (RICK).

Malignant disease is widely prevalent and in the west, almost a third of population on will develop cancer at some time during their life and the geographical distribution plays a role that the incidence of specific tumors.

Varies is geographical location, but the cause varies for example England and Scotland have the highest death rate from malignant disease in world such as lung cancer due to smoking. Liver cancer occurs word wide but is rare in Europe and North America. Stomach cancer is particularly prevalent in japan due to dietary factors.

(Kumar and Clark 2008) as cited by Mohammed (2014) vex in increment rate every years, this increasing rate indicating to many factor to be blamed such as public awareness about cancer or guidance, and increasing the etiological factors. Such research turns to incidence the most common cancer type in Radiation and Isotopes Center (RICK).

2:1 Problem of Study:

Certain types of cancer predominant in Radiation and Isotopes Center (RICK) and the incidence are increased in the last decades but no statistical analyses was done in Khartoum state hospitals.

3:1 Objective:

1:3:1 General Objective:

To study the incidence of cancers in Radiation and Isotopes Center (RICK*).*

2:3:1 Specific Objectives:

- To high light the most common cancers frequency in Radiation and Isotopes Center (RICK).
- To study the incidence of cancers according to age, gender, site of cancer, symptoms, diagnose and treatment.
- To correlate the findings with age and gender, symptoms, diagnose and treatment.

4:1 Thesis Outline:

The general framework of this research was built in five chapter as follows:

- Chapter one is the introduction to this thesis, this chapter discusses the problem and objectives of study.
- Chapter two dealing with literature review, and pervious study.
- Chapter three dealing with material and method.
- Chapter four present the result of this study.
- Chapter five present the discussion, conclusion and recommendation of the thesis.

Chapter Two

Literature Review

2:1 Cancer:

Cancer is the uncontrolled growth of abnormal cells in the body. Cancer develops when the body's normal control mechanism stops working. Old cells do not die and cells grow out of control, forming new, abnormal cells. These extra cells may form a mass of tissue, called a tumor. Some cancers, such as Leukemia, do not form tumors. (Cancer Treatment Centers of America, 2017)

Mohammed (2014) mention that the term "tumor" denotes amass, weather neoplastic, or inflammatory. The term "cancer" is genetic from any malignant tumor.

Willis (1967) as cited by Mohammed (2014) defined neoplasm as mass, the growth of which in coordinate with the surrounding normal tissues that persist in the absence of the inciting stimulus.

Mckinnell (1998) mention that is definition of neoplasm states that the mass persist in the absence of inciting stimulus, which distinguishes the neoplasm from the modulations of grow that also result in changes in mass. The modulations are considered to be normal cellular responses the environmental stimulus is present.

2:2 Benign Versus Malignant tumors:

2:2:1 Benign Tumor: (the mass is not cancerous). Is similar to cancer because the growth is a result of abnormal cells. However, unlike cancer, it is unable to spread to other areas of the body (such as the brain or lungs) and it does not affect nearby tissue. They a contained mass stays where it grows. They can often be removed, and, in most cases, they do not come back and not dangerous; however, the

location of the tumor is what poses the threat. If the mass puts pressure on a primary nerve, a main artery, or compresses brain matter, even a benign tumor can cause serious problems. Some suspected causes of benign tumors include a traumatic injury at the tumor location, chronic inflammation (or long-term stress that leads to inflammation), an undetected infection, or diet.

Benign tumors are often surrounded by a protective "sac "it a mechanism performed by your immune system – that segregates it from the rest of your body and enables it to be easily removed, often surrounds benign tumors. Some benign tumors can become malignant but it is rare. (Bollinger, (2017))

Most common types of benign tumors: Adenomas (epithelial tissue that covers the organs and glands), Meningioma's (brain and spinal cord), Fibromas or fibroids (connective tissue of any organ – most commonly found in the uterus), Papilloma's (skin, breast, cervix, and mucus membranes), Lipoma's (fat cells), Nevi (moles), Moya's (muscle tissue), Hemangioma's (blood vessels and skin), Neuroma's (nerves) Osteochondroma's (bones). (Bollinger, 2017)

2:2:2 Malignant Tumor: (the mass is cancerous). The word malignant is Latin for "badly born". This type of tumor has the ability to multiply uncontrollably, to metastasize (spread) to various parts of the body and invade surrounding tissue via the blood stream, circulatory system and lymphatic system. Malignant cells do not have chemical adhesion molecules to anchor them to the original growth site that benign tumors possess. There are many suspected causes of cancer, which are discussed later. Malignant tumor are usually bigger than benign. Well, we can use these types of visually observable or palpable differences for tumors as well. Benign tumors usually grow very slowly, while malignant tumors grow more quickly in size. (Cheprasov, 2017)

Benign tumors are also more likely to be freely movable within or on the tissue; they reside on, while malignant tumors may be more difficult to move around due to local tissue invasion. Malignant tumor do not sit in a protective “sac’ resulting in more difficult to remove out of the body. The edges of benign tumor is very demarcated in a certain shape, this in contrast to malignant tumor may have an irregular in shape; it may be difficult to tell were the tumor starts and ends. (Cheprasov, 2017)

Benign tumors on rare occasion may actually be life threatening, but as a rule are not nearly as bad as the malignant tumors. The malignant tumors are like those killer bees. You don't even have to be doing anything to them or be anywhere close to their hive, and they'll just spread out and attack you en masse - even kill you if they're severe enough. (Cheprasov, 2017)

Most common types of malignant tumors: Sarcomas (connective tissues such as muscle, tendon, fat, and cartilage), Carcinomas (organs and gland tissue such as the breast, cervix, prostate, lung, and thyroid).

Figure [2:1]: show benign and malignant tumor of the breast. By (The National Cancer Institute, 2015**)**

2:3 Cancer Cell Development:

2:3:1 Cell Division: Before a cell divides, it must duplicate all of its contents. It makes exact copies of its 46 chromosomes so that each of the two daughter cells

will have exactly the same genes as the parent cell. This involves a complex process in which the DNA strands in each chromosome untwist so that they can be copied. The cell forms two identical double helices, one of which will be transferred to each of the two daughter cells when division occurs. Because this process is so complex, errors (mutations) frequently occur. The cell recognizes most of these errors and automatically repairs them. However, some errors are missed and may be passed on to the daughter cell. (Canadian Cancer Society, 2017)

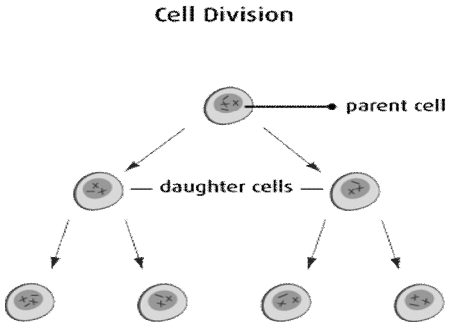

Figure [2-2]: show cell division. (Canadian Cancer Society, 2017)

Normal cell needs several injuries (mutations) before it will change into a cancer cell. These injuries to the cell affect how it grows, works, reproduces and dies. They may cause the cell to continue to grow and divide out of control instead of dying when it should. Although there are many different types of cancer, they all start because of uncontrolled, abnormal growth of cells. Cancer cells behave differently from normal cells because they do not: stop dividing, obey signals from other normal cells, stick together very well and can spread to other parts of the body, specialize into mature cells but stay immature. (Canadian Cancer Society, 2017)

2:3:2 Gene Mutations: Most cancers caused by a change in or damage to genes. A change in a gene is called a gene mutation. One might think of gene mutations as

spelling errors that have not been corrected by gene repair mechanisms, which are like spell checkers that look for and fix mistakes. Mutations can affect the structure of the gene and stop it from working properly.

Genes can become mutated for various reasons, and mutations can occur in several different ways. The simplest type of mutation is a substitution of a different DNA base, which could change the message of the gene. Other types of simple mutations include deletion or duplication of one or more bases (nucleotides). Some mutations do not affect critical areas of a gene and may not cause a problem, but other mutations will. There are two basic causes of gene mutations can occur by chance or be inherited. (Canadian Cancer Society, 2017)

2:3:3 Types of Cancer Genes: Three main classes of genes that are important in controlling cell growth, and play a role in cancer cell development; people may inherit a mutated form of one of these genes, which may make them more likely to develop a particular type of cancer.

2:3:3:1 Oncogenes: Oncogenes cause cells to grow out of control. They promote cancer cell growth. Oncogenes are damaged versions of normal genes called proto-oncogenes, Proto-oncogenes control a variety of cell functions related to cell growth and reproduction. Every person has two copies of each gene (one inherited from each parent). Oncogene mutations are dominant, which means that an inherited defect in one copy of a proto-oncogene can lead to cancer even if the second copy of the gene is normal. (Canadian Cancer Society, 2017)

2:3:3:2 Tumor Suppressor Genes: Tumor suppressor genes are genes that normally protect against cancer. They act as brakes and help stop cell growth and control cell death. If tumor suppressor genes are damaged, missing or otherwise do not work properly, cell growth, cell division and cell death (apoptosis) may not be

controlled. Nearly 50% of all cancers are thought to involve a damaged or missing tumor suppressor gene. Gene mutations are recessive, which means that both copies of the gene need to have a defect for the person to be at risk of developing cancer. (Canadian Cancer Society, 2017)

2:3:3:3 DNA Repair Genes: DNA repair genes are responsible for repairing damaged genes. They fix mistakes (mutations) that commonly occur when DNA is being copied. If these genes themselves are damaged, mutations may not be repaired and will build up. DNA repair genes may also be considered a type of tumor suppressor gene. DNA repair gene mutations are also recessive, so both copies of the gene need to have a defect for the person to be at risk of developing cancer. (Canadian Cancer Society, 2017)

2:3:4 Steps of Cancer Development: Generally, cancer develops in three main steps. It can take a long time for cancer to develop because several steps and several genetic mutations are usually required. Usually many years pass between exposure to a cancer-causing agent or event and cancer actually developing. This period is called the latency period, or lag time. The chance of cancer developing increases as a person gets older because there has been more time for exposures and mutations to build up.

2:3:4:1 Initiation: Many cancers are caused by gene mutations. Each cell has the ability to spot these mutations and can either destroy itself (by apoptosis) or fix the mutations before they are passed on to new cells. If the cell's ability to make these repairs fails and more mutations occur, the damaged cell is more likely to become cancerous. Carcinogens, such as chemicals, smoking or exposure to radiation, may cause this initial change but often the cause is unknown and may be a random. Changes caused by carcinogens are called *initiators.* The cell starts to become abnormal at this stage. (Canadian Cancer Society, 2017)

2:3:4:2 Promotion: Further and repeated damage needs to occur before cancer develops. Agents, such as hormones or some drugs, cause this further damage and are called *promoters*. Unlike carcinogens, promoters do not cause cancer by themselves, but allow a cell that has undergone initiation to become cancerous. Some carcinogens, such as exposure to large doses of radiation, are powerful enough to cause cancer without the help of promoters. (Canadian Cancer Society, 2017)

2:3:4:3 Progression: The change in a normal cell causes it to behave, grow and function quite differently and turn into a cancer cell. The cell's growth instructions are mixed up; this causes the cell to go on growing and reproducing itself. The time it takes a cell to double in number called the doubling time. A fast-growing cancer cell may double over 1–4 weeks, a slower growing one over 2–6 months. The doubling time varies with the type of cancer cell and how aggressive it.

In adults, usually a long developmental (latency) period after initiation during which promotion and progression are occurring, which means it takes a long time before a cell becomes cancerous. In children, this latency period is much shorter. As cancer cells grow, they can group together to form a tumor that is big enough to be detected by an imaging test. By this time, the cancer cell has undergone about 30 or more doublings, and even though the tumor is very small, it can contain about a billion cells. (Canadian Cancer Society, 2017)

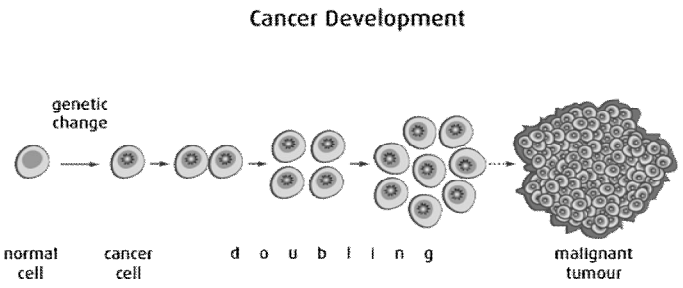

Figure [2-3]: show cancer development. (Canadian Cancer Society, 2017)

2:3:4:4 Metastasis: As cancer cells divide, they can invade surrounding tissue. They can also break away from the original (primary) tumor and enter the bloodstream or lymphatic system to reach to distant parts of the body and form secondary tumor (metastasize).Childhood cancers tend to metastasize earlier than adult cancers. About 80% of childhood cancers have metastasized when are diagnosed. (Canadian Cancer Society, 2017)

2:4 Classification of cancer: It determines appropriate treatment and helps determine the prognosis. It is made according to the site of origin of the malignant cells; the histology, or cell analysis (called grading); and the extent of the disease (called staging).

2:4:1 Site of Origin: It is classification describes the type of tissue in which the cancer cells begin to develop: Adenocarcinoma (originates in glandular tissue), Blastocytoma (originates in embryonic tissue of organs), Carcinoma (originates in epithelial tissue i.e. Tissue that lines organs and tubes), Leukemia (originates in tissues that form blood cells), Lymphoma (originates in lymphatic tissue), Myeloma (originates in bone marrow), Sarcoma (originates in connective or supportive tissue i.e. bone, cartilage, muscle). (Editorial Staff at health communities.com, 2014)

2:4:2 Tumor Grading: involves examining tumor cells that have been obtained through biopsy under a microscope. The abnormality of the cells determines the grade of the cancer. Increasing abnormality increases the grade, from 1–4. Cells that are well differentiated closely resemble mature, specialized cells. Cells that are undifferentiated are highly abnormal, that is, immature and primitive. (Editorial Staff at health communities.com, 2014)

Table [2-1]: show Grade of tumor from1 to 4

Grade 1	Cells slightly abnormal and well differentiated
Grade 2	Cells more abnormal and moderately differentiated
Grade 3	Cells very abnormal and poorly differentiated
Grade 4	Cells immature and undifferentiated

2:4:3 Cancer Staging: Staging is the classification of the extent of the disease. There are several types of staging methods.

2:4:3:1 The tumor, node, metastases (TNM) system classifies cancer by tumor size (T), the degree of regional spread or node involvement (N), and distant metastasis (M): (Editorial Staff at health communities.com, 2014)

Table [2-2]: show (TNM) classification system

T0	No evidence of tumor
Tis	Carcinoma in situ (limited to surface cells)
T1-4	Increasing tumor size and involvement
N0	No lymph node involvement
N1-4	Increasing degrees of lymph node
Nix	Lymph node involvement cannot be assessed
MO	No evidence of distant metastases
M1	Evidence of distant metastases

2:4:3:2 a numerical System also used to classify the extent of disease:

Table [2-3]: show numerical classification system

Stage 0	Cancer in situ (limited to surface cells)
Stage I	Cancer limited to the tissue of origin, evidence of tumor growth
Stage II	Limited local spread of cancerous cells
Stage III	Extensive local and regional spread
Stage IV	Distant metastasis

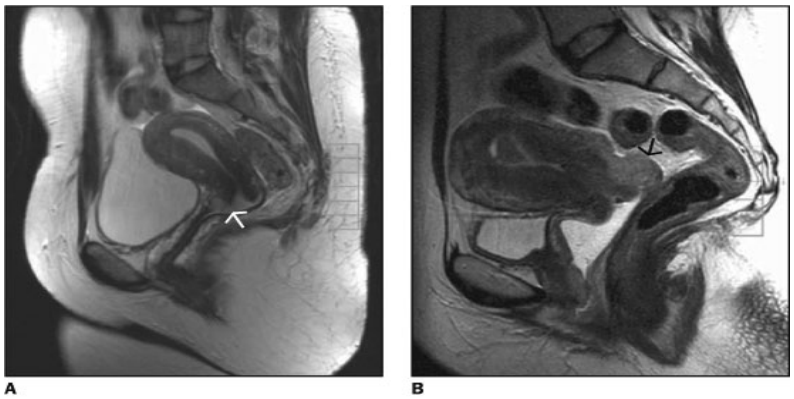

Figure 2. A: Sagittal T2-weighted TSE sequence, hyperintense uterine cervix tumor. Part of the (hypointense) cervical stroma is intact. Preserved vaginal canal (stage Ib). **B:** Sagittal T2-weighted TSE sequence, slightly hyperintense tumor in the posterior portion of the uterine cervix, extending to the upper vaginal third (stage IIa).

Figure [2-4]: show the stage of cancer

[http://www.scielo.br/scielo.php?pid=s010039842007000300014&script=sci_arttext&tlng=ne]

2:5 Cancer Epidemiology:

2:5:1 Definition: Cancer epidemiology is concerned with the study of the distribution of the disease cancer in populations. Its ultimate goal is to identify risk factors that may lead to early introduction of effective preventive measures. (Bucks, 1988)

2:5:2 Risk Factors: These are the most common risk factors for cancer:

2:5:2:1Growing older, most cancers occur in people over the age of 65. However, people of all ages, including children, can get cancer, too.

2:5:2:2Tobacco, using tobacco products increases the risk of cancer.

2:5:2:3Sunlight, Ultraviolet (UV) radiation comes from the sun, sunlamps, and tanning booths. It causes early aging of the skin and skin damage that can lead to skin cancer.

2:5:2:4 Ionizing radiation, Ionizing radiation can cause cell damage that leads to cancer. This kind of radiation comes from rays that enter the Earth's atmosphere from outer space, radioactive fallout, radon gas, X-rays, and other sources. (John et al., 2017)

2:5:2:5 certain chemicals and other substances, People who have certain jobs (such as painters, construction workers, and those in the chemical industry) have an increased risk of cancer. Many studies have shown that exposure to asbestos, benzene, benzamine, cadmium, nickel, or vinyl chloride in the workplace can cause cancer.

2:5:2:6 some viruses and bacteria, such as Human papillomaviruses (HPVs):

HPV infection is the main cause of cervical cancer; it also may be a risk factor for other types of cancer. Hepatitis B and hepatitis C viruses causes liver cancer. Human immunodeficiency virus (HIV): HIV is the virus that causes AIDS for lymphoma and Kaposi's sarcoma. Epstein-Barr virus (EBV): Infection with EBV has been linked to an increased risk of lymphoma. Human herpes virus 8 (HHV8): This virus is a risk factor for Kaposi's sarcoma. Helicobacter pylori: This bacterium can cause stomach ulcers. It also can cause stomach and lymphoma in the stomach lining.

2:5:2:7 certain hormones, menopausal hormone therapy can cause serious side effects. Hormones may increase the risk of breast cancer, heart attack, stroke, or blood clots. (John et al., 2017)

2:5:2:8 Family history of cancer, some gene changes that increase the risk of cancer are passed from parent to child. These changes are present at birth in all

cells of the body; it is uncommon for cancer to run in a family. However, certain types of cancer do occur more often in some families than in the rest of the population. For example, melanoma and cancers of the breast, ovary, prostate, and colon sometimes run in families. Several cases of the same cancer type in a family linked to inherited gene changes, which may increase the chance of developing cancers. (John et al., 2017)

2:5:2:9Alcohol,Having more than two drinks each day for many years may increase the chance of developing cancers of the mouth, throat, esophagus, larynx, liver, and breast. The risk increases with the amount of alcohol that a person drinks. For most of these cancers, the risk is higher for a drinker who uses tobacco.

2:5:2:10 Poor diet, lack of physical activity, or being overweight People who have a poor diet, do not have enough physical activity, or are overweight may be at increased risk of several types of cancer. For example, studies suggest that people whose diet is high in fat have an increased risk of cancers of the colon, uterus, and prostate. Lack of physical activity and being overweight are risk factors for cancers of the breast, colon, esophagus, kidney, and uterus. Choose a diet rich in fruits and vegetables.

Having a healthy diet, being physically active, and maintaining a healthy weight may help reduce cancer risk. (John et al., 2017)

2:5:3 Cancer Risk Factor Facts:

2:5:3:1 some causes of cancer can be prevented but others such as family history or aging cannot.

2:5:3:2 can help prevent many forms of cancer by quitting smoking, staying out of the sun and using sunscreen regularly, follow all safety precautions if you work with dangerous chemicals, do not have unprotected sex or share needles, get the

vaccine that prevents hepatitis B infection . If you are at risk for getting hepatitis B, drink in moderation, eat a balanced diet, exercise, and maintain a healthy weight.

2:5:3:3 not everything causes cancer.

2:5:3:4 Cancer is not caused by an injury, such as a bump or bruise.

2:5:3:5 Cancer is not contagious. Although being infected with certain viruses or bacteria may increase the risk of some types of cancer, no one can "catch" cancer from another person.

2:5:3:6 having one or more risk factors does not mean that you will get cancer. Most people who have risk factors never develop cancer.

2:5:3:7Some people are more sensitive than others are to the known risk factors. (John et al., 2017)

2:5:4 Some Examples of Studies Looking at Risk Factor of Cancer:

One large research study (Kirkegaard et al., 2010) as cited Kenny (2014)] followed up over 55,000 people for 10 years. It looked at lifestyle factors and rates of cancer. The study concluded that by following recommendations on keeping physically active, keeping weight in check, not smoking, drinking alcohol in moderation and having a healthy diet, the risk of developing bowel cancer could be reduced by as much as 23%. However, the study found that even improving in some of these lifestyle factors had some reduction in risk.

A study (Schutze et al., 2011) as cited Kenny (2014) that followed up 363,988 people found that about 10 in 100 of all cancers in men and about 3 in 100 in women in Western Europe are caused by people drinking alcohol. Most cancer cases were in people who drank higher than the recommended upper limits. However, the study found that even drinking more than two units a day for men and more than one unit a day for women significantly increased the risk of developing certain cancers.

A study (Pan et al., 2012) as cited Kenny (2014) that followed up over 100,000 people in the USA suggests that cutting the amount of red meat in most people's diets to 42 g per day (equal to about one large steak a week) could significantly reduce the incidence of certain cancers.

A large review of data (Parkins et al., 2011) as cited Kenny (2014) by found that about 4 in 10 cancers diagnosed in the UK each year - over 130,000 in total - caused by avoidable lifestyle factors and choices including smoking, alcohol, weight and diet. Quote from lead author Professor Perkins "Many people believe cancer is down to fate or 'in the genes' and that it is the luck of the draw whether they get it. Looking at all the evidence, it's clear that around 40% of all cancers are caused by things we mostly have the power to change".

One research study estimated that about one in six cancers - two million a year globally caused by largely treatable or preventable infections. They estimated that four infections - HPV, *H.* pylori, and hepatitis B and C viruses - accounted for 1.9 million cases of cervical, stomach and liver cancers in 2008. Most of these were in the developing world. Initiatives such as immunization against HPV and hepatitis B are helping to combat these infections. However, most viruses and viral infections are not linked to cancer. (Kenny, 2014)

2:6 Symptoms of Cancer:

Cancer is a group of diseases that can cause almost any sign or symptom. The signs and symptoms will depend on were the cancer is, how big it is, and how much it affects the organs or tissues. If a cancer has spread (metastasized), signs or symptoms may appear in different parts of the body. As a cancer grows, it can begin to push on nearby organs, blood vessels, and nerves. This pressure causes

some of the signs and symptoms of cancer. If the cancer is in a critical area, such as certain parts of the brain, even the smallest tumor can cause symptoms. Cancer may also cause symptoms like fever, extreme tiredness (fatigue), or weight loss. This may be because cancer cells use up much of the body's energy supply, or they may release substances that change the way the body makes energy from food. Cancer can also cause the immune system to react in ways that produce these signs and symptoms. (American Cancer Society**,** 2014)

2:6:1 General Signs and Symptoms of Cancer:

2:6:1:1 Unexplained weight loss: An unexplained weight loss of 10 pounds or more may be the first sign of cancer. This happens most often with cancers of the pancreas , stomach, esophagus, or lung.

2:6:1:2 Fever: fever may be an early sign of cancer, such as blood cancers like leukemia or lymphoma.

2:6:1:3 Fatigue: Fatigue is extreme tiredness that does not get better with rest. It may be an important symptom as cancer grows. However, it may happen early in some cancers, like leukemia. Some colon or stomach cancers can cause blood loss that is not obvious. This another way cancer can cause fatigue. (American Cancer Society**,** 2014)

2:6:1:4 Pain: Pain may be an early symptom with some cancers like bone cancers or testicular cancer. A headache that does not go away or get better with treatment may be a symptom of a brain tumor. Back pain can be a symptom of cancer of the colon, rectum, or ovary. Most often, pain due to cancer means it has already spread (metastasized) from where it started. 2:6:1:5 Skin changes: Along

with cancers, that is include: Darker looking skin (hyperpigmentation), Yellowish skin and eyes (jaundice), Reddened skin (erythema), itching (purities), Excessive hair growth.

2:6:2 Signs and Symptoms of Certain Cancers:

2:6:2:1Change in bowel habits or bladder function: Long-term constipation, diarrhea, or a change in the size of the stool may be a sign of colon cancer. Pain when passing urine, blood in the urine, or a change in bladder function (such as needing to pass urine more or less often than usual) related to bladder or prostate cancer.

2:6:2:2 Sores that do not heal: Skin may bleed and look like sores that do not heal. A long-lasting sore in the mouth could be an oral cancer. Sores on the penis or vagina may either be signs of infection or an early cancer. (American Cancer Society**,** 2014)

2:6:2:3 White patches inside the mouth or white spots on the tongue: it may be leukoplakia. Leukoplakia is a pre-cancerous area that is caused by frequent irritation. It is often caused by smoking or other tobacco use. If it is not treated, leukoplakia can become mouth cancer.

2:6:2:4 Unusual bleeding or discharge: Unusual bleeding can happen in early or advanced cancer. Coughing up blood may be a sign of lung cancer. Blood in the stool could be a sign of colon or rectal cancer. Cancer of the cervix or the *endometrium* (lining of the uterus) can cause abnormal vaginal bleeding. (American Cancer Society**,** 2014)

Blood in the urine may be a sign of bladder or kidney cancer. A bloody discharge from the nipple may be a sign of breast cancer.

2:6:2:5 Thickening or lump in the breast or other parts of the body, many cancers can be felt through the skin. These cancers occur mostly in the breast, testicle, lymph nodes (glands), and the soft tissues of the body. 2:6:2:6 Indigestion or trouble swallowing: it may be signs of cancer of the esophagus, stomach, or pharynx (throat).

2:6:2:7Recent change in a wart or mole or any new skin change, any other skin changes should reported .A skin change might be a melanoma .

2:6:2:8 Nagging cough or hoarseness: A cough that does not go away may be a sign of cancer. Hoarseness can be a sign of cancer of the larynx or thyroid gland. (American Cancer Society**,** 2014)

2:7 Diagnosis of Cancer: Like symptoms, the signs of cancer vary based on the type and location of the tumor. Most cancers are diagnosed by biopsy. Depending on the location of the tumor, the biopsy may be a simple procedure or a serious operation. Most patients with cancer have CT scans to determine the exact location and size of the tumor or tumors. (Moscow JA et el. and Thune MJ et el., 2011)

2:7:1 Lab Tests: high or low levels of certain substances in the body can be a sign of cancer. Therefore, lab tests of the blood, urine, or other body fluids that measure these substances can help to make a diagnosis. However, abnormal lab results are not a sure sign of cancer. Lab tests are an important tool, but cannot rely on them alone to diagnose cancer.

2:7:2 Imaging Procedures: imaging create pictures of areas inside your body that help to see whether a tumor is present, these pictures can be made in several ways: CT scan, Nuclear Scan, Ultrasound, MRI, PET scan, and X-rays. (The National Cancer Institute, 2015)

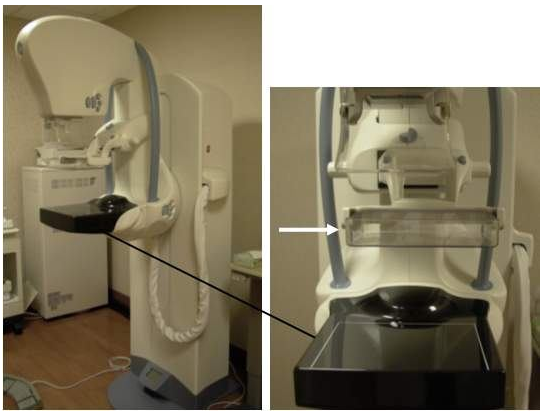

Figure [2-5]: show a digital mammogram-imaging unit. By (Nicholas, 2012)

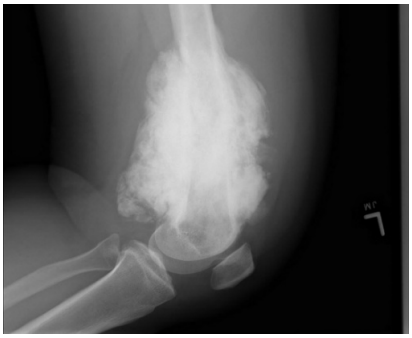

Figure [2-6]: show role of x-ray to diagnose cancer (Osteosarcoma Distal Femur). (http://www.boneschool.com/book/export/html/186)

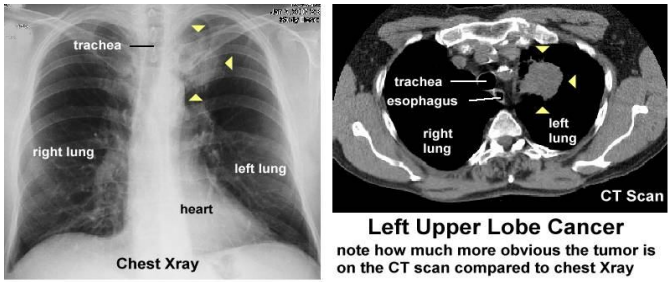

Figure [2-7]: show role of CT scan to diagnose cancer

(http://www.aboutcancer.com/lung_CT_BMC_Feb_2007.jpg)

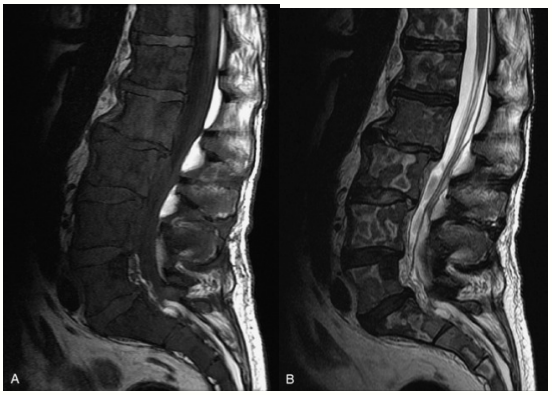

Figure [2-8]: show role of MRI to diagnose cancer. **A,** Sagittal T1WI. **B,** Sagittal T2WI. (http://clinicalgate.com/radiographic-evaluation-of-lesions-within-the-vertebrae-2/.)

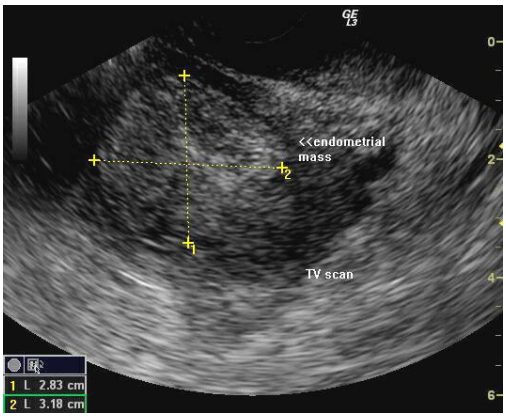

Figure [2-9]: show role of US Scan to diagnose cancer

(http://www.ultrasound-images.com/carcinoma/)

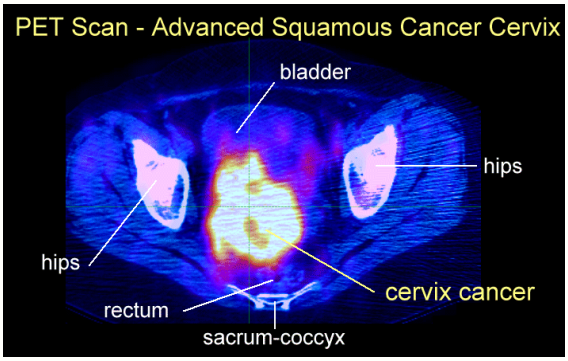

Figure [2-10]: show role of PET scan to diagnose cancer.

(htt://www.aboutcancer.com./gyn_pet_scans.htm)

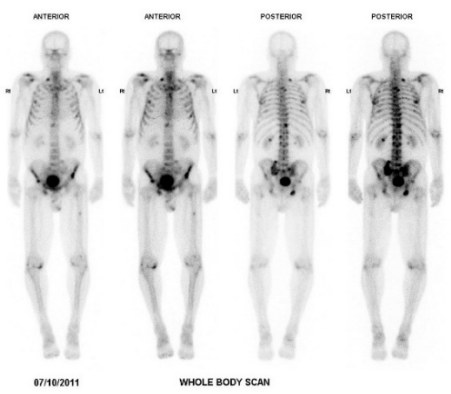

Figure [2-11]: show of role NM Scan to diagnose cancer, Prostate cancer. On chemo and hormonal therapy. Follow up bone scan.

(https://radiopaedia.org/cases/superscan-due-to-metastatic-prostate-cancer)

2:7:3 Biopsy: In most cases need to do a biopsy to make a diagnosis of cancer. A biopsy is a procedure in which the doctor removes a sample of tissue. A pathologist then looks at the tissue under a microscope to see if it is cancer. The sample may be removed in several ways:

2:7:3:1With a needle: The doctor uses a needle to withdraw tissue or fluid.

2:7:3:2 With an endoscope: The doctor looks at areas inside the body using a thin, lighted tube called an endoscope. The scope is inserted through a natural opening, such as the mouth. Then, the doctor uses a special tool to remove tissue or cells through the tube.

2:7:3:3With surgery: Surgery may be excisional or incisional. In an excisional biopsy, the surgeon removes the entire tumor. Often some of the normal tissue around the tumor also is removed. In an incisional biopsy, the surgeon removes just part of the tumor. (The National Cancer Institute, 2015)

2:8 Cancer Treatment: There are many types of cancer treatment. The types of treatment will depend on the type of cancer and how advanced it is. Some people with cancer will have only one treatment. However, most people have a

combination of treatments. (The National Cancer Institute, 2015). The main types of cancer treatment include:

2:8:1 Surgery: is cutting away tissue from the body, surgery used to:

2:8:1:1 to diagnose cancer by remove a small piece of tissue. This called a biopsy.

2:8:1:2 as a treatment to cure cancer, surgery is one of the main treatments for cancer. It is likely to cure small, early stage cancers that have not spread to other parts of the body, so surgery is an option depends on {the type of cancer, the stage and position of cancer, general health}. In which surgeon removes the tumor and some normal tissue from around the cancer (known as a clear margin). They might also remove the lymph nodes nearest to the cancer, in case they contain cancer cells. (De Vita et el. 2011; Langhorne et el. 2007)

Some people have treatment before surgery to help shrink a cancer and make it easier to remove. This is called adjuvant treatment. Radiotherapy might be used to shrink tumors and help to control symptoms. If cancer has spread or is at an advanced stage, surgery might not be the best treatment. It may be better to have a treatment that reaches all parts of body, such as chemotherapy, biological therapy or hormone therapy.

Surgery is not used for some types of cancer of the blood system (leukemia), (lymphoma), if the cancer cells are spread throughout the body. If the cancer is in many areas, surgery will not get rid of it all. (De Vita et el. 2011; Langhorne et el. 2007)

2:8:1:3 to reconstruct a part of body if part of body removed, it might be possible to have reconstructive surgery. The part of the body is recreated using other body tissues or a false body part (prosthesis). For example breast or bladder reconstruction.

2:8:1:4 To prevent or reduce the risk of cancer: people who have a rare inherited condition called Familial Adenomatous Polyposis (FAP) have an increased risk of bowel cancer. Therefore, they might choose to have surgery to remove their large bowel. Women who have a high risk of breast cancer may choose to have their breasts removed.

2:8:1:5 as part of other treatments, For example, a small operation to put a thin tube called a central line into a main vein in chest. The tube stays in throughout your treatment. It makes having chemotherapy or biological therapy easier because do not need to have a needle put into a vein each time have treatment and can also have blood taken from the tube.

2:8:1:6 To control symptoms or extend life: people might have surgery to relieve symptoms if their cancers cannot be completely removed, or cured with other treatments. For example, cancers in the abdomen can sometimes block the bowel and cause sickness and pain. An operation to remove the blockage can relieve these symptoms. Surgery might also help to control pain by removing cancer that is pressing on a body organ or nerve. (De Vita et el. 2011; Langhorne et el. 2007)

2:8:2 Radiotherapy: means the use of radiation to treat cancer. About 4 out of 10 people with cancer (40%) have radiotherapy as part of their treatment. It is given in various ways, including: From outside the body as external radiotherapy, using high-energy X-rays from linear accelerator machines, electrons, and more rarely other particles such as protons. From within the body as internal radiotherapy,

using high-energy gamma rays from drinking a liquid that is taken up by cancer cells or by putting radioactive material in, or close to, the tumor. (De Vita et el. 2011; Langhorne et el. 2007)

Radiotherapy destroys the cancer cells in the treated area by damaging the DNA within these cells. Although normal cells also affected by radiation, they are better at repairing themselves than the cancer cells. The treatment aims to give a high dose to the cancer but as low a dose as possible to the surrounding healthy cells. The healthy cells can then recover. This aims to give the highest chance of curing or shrinking the cancer while reducing the risk of side effects.

Figure [2-12]: show radiation therapy equipment (http://www.swgeneral.com/cancer-care/revolutionary-radiation-therapy/)

Radiotherapy used to treat cancer by:

2:8:2:1 Curative treatment**:** used to cure a patient of their cancer by destroy a cancerous tumor It is one of the most important treatments to help cure cancer. Curative radiotherapy may be combined with other treatments, such as surgery, chemotherapy, hormonal therapy or biological therapy.

2:8:2:2 Palliative treatment: to control symptoms by used radiotherapy to relieve symptoms, for example to reduce pain.

2:8:2:3 Preoperative radiotherapy: or treatment before surgery to shrink a tumor and so make it safer and easier to remove, or the radiotherapy can reduce the risk of the cancer spreading during surgery

2:8:2:4 Postoperative radiotherapy: or Treatment after surgery to kill off any remaining cancer cells after the operation. It aims to lower the risk of the cancer coming back. It is often used in breast cancer, rectal cancer, and cancers of the head and neck area. (De Vita et el. 2011; Langhorne et el. 2007)

2:8:2:5 Chemoradiotherapy or chemo radiation: Chemotherapy can be given before, during or after a course of radiotherapy.

2:8:2:6 Total body irradiation (TBI):is a type of radiotherapy sometimes given to patients having a bone marrow transplant or stem cell transplant, for example for some types of leukemia or lymphoma. Radiation to the whole body combined with chemotherapy. The treatment destroys the bone marrow cells. Then have new bone marrow or stem cells into bloodstream. (De Vita et el. 2011; Langhorne et el. 2007)

2:8:3 Chemotherapy: Chemotherapy literally means drug treatment. In cancer treatment, the term chemotherapy means treatment with cell killing (cytotoxic) drugs. It depends on many things. These include: The type of cancer, Where in body the cancer started, the grade of cancer, spread of cancer, general health. Chemotherapy used as a single drug or a combination of drugs. its own or with other treatments such as: Radiotherapy ,Surgery ,Hormone therapy ,Biological therapy ,A combination of any of these treatments. High dose chemotherapy treatment as part of a bone marrow or stem cell transplant. The main ways of chemotherapy are as an injection, a drip into the bloodstream, or tablets or capsules. The chemotherapy drugs circulate all-round the body in the bloodstream

to reach the cancer cells. (Michael 2008; De Vita et el., Skeet et el, Dougherty et el. 2011). Chemotherapy used to [control or cure the cancer]: To shrink a cancer before surgery or radiotherapy. To try to stop cancer coming back after surgery or radiotherapy. As a treatment on its own, if the type of cancer is very sensitive to it. To treat cancer that has spread from where it first started. (Michael 2008; De Vita et el., Skeet et el, Dougherty et el. 2011)

2:8:4 Immunotherapy: Immunotherapy is a type of cancer treatment that helps immune system to fight cancer. The immune system helps body to fight infections and other diseases. It made up of white blood cells, and organs and tissues of the lymph system. Immunotherapy is a type of biological therapy. (The National Cancer Institute, 2015)

Biological therapy is a type of treatment that uses substances made from living organisms to treat cancer. Many different types of immunotherapy are used to treat cancer. They include:

2:8:4:1 Monoclonal antibodies, which are drugs that are designed to bind to specific targets in the body. They can cause an immune response that destroys cancer cells. Other types of monoclonal antibodies can “mark” cancer cells so it is easier for the immune system to find and destroy them. These types of monoclonal antibodies may also be referred to as targeted therapy.

2:8:4:2 Adoptive cell transfer, which is a treatment that attempts to, boost the natural ability of your T cells to fight cancer. T cells are a type of white blood cell and part of the immune system. (The National Cancer Institute, 2015)

2:8:4:3 cytokines, which are proteins that are made by the body's cells. They play important roles in the body's normal immune responses and in the immune system's ability to respond to cancer.

2:8:4:4 Treatment Vaccines, which work against cancer by boosting the immune system's response to cancer cells. Treatment vaccines are different from the ones that help prevent disease.

2:8:4:5 BCG, which stands for Bacillus Chalmette Guerin, is an immunotherapy that used to treat bladder cancer. A weakened form of the bacteria that causes tuberculosis. When inserted directly into the bladder with a catheter, BCG causes an immune response against cancer cells, also being studied in other types of cancer.

Immunotherapy Works against Cancer by: One reason that cancer cells thrive because they are able to hide from your immune system. Certain immunotherapies can mark cancer cells so it is easier for the immune system to find and destroy them. Other immunotherapies boost your immune system to work better against cancer. (The National Cancer Institute, 2015)

Immunotherapy Can Cause Side Effects**;** The most common side effects are skin reactions at the needle site.

Different forms of immunotherapy may be given in different ways. These include intravenous, oral in pills or capsules that is swallow, Topical the immunotherapy comes in a cream that is rub onto your skin, this type of immunotherapy can used for very early skin cancer. Intra vesicle when the immunotherapy goes directly into the bladder. (The National Cancer Institute, 2015)

2:8:5 Targeted Therapy: A type of treatment that uses drugs or other substances to identify and attack specific types of cancer cells with less harm to normal cells. Targeted therapy is a special type of chemotherapy that takes advantage of differences between normal cells and cancer cells. It is sometimes used alone, but most often, other cancer treatments are used with targeted therapy such as chemo, surgery, and/or radiation therapy. (The National Cancer Institute, 2014)

Some targeted therapies block the action of certain enzymes, proteins, or other molecules involved in the growth and spread of cancer cells. Other types of targeted therapies help the immune system kill cancer cells or deliver toxic substances directly to cancer cells and kill them. Targeted therapy may have fewer side effects than other types of cancer treatment. Most targeted therapies are either small molecule drugs or monoclonal antibodies.

2:8:5:1Small-molecule drugs are small enough to enter cells easily, so they are used for targets that are inside cells.
2:8:5:2 Monoclonal antibodies are drugs that are not able to enter cells easily. Instead, they attach to specific targets on the outer surface of cancer cells.

They treat cancer in many different ways: Block or turn off chemical signals that tell the cancer cell to grow and divide, Change proteins within the cancer cells so the cells die, Stop making new blood vessels to feed the cancer cells, Trigger your immune system to kill the cancer cells. Carry a toxin to the cancer cell to kill it, but not normal cells. . (The National Cancer Institute, 2014)

2:8:6 Hormone Therapy: is a cancer treatment that slows or stops the growth of cancer that uses hormones to grow. Hormone therapy also called endocrine therapy.

Hormone therapy works: Some cancers use hormones to grow, these cancers called hormone sensitive or hormone dependent. Hormone therapy uses drugs that either stop the body producing hormones or prevent hormones from making the cancer cells grow and divide. Cancers that can be hormone sensitive include breast, prostate, Ovarian cancer , womb (also called uterine or endometrial cancer), and kidney cancers. (Fischer et al. 2003; De Vita et al. and Rosenberg 2008) Types of hormone therapy: Breast cancer hormone therapy, Prostate cancer hormone therapy ,Womb cancer hormone therapy, Ovarian cancer hormone therapy, Kidney cancer hormone therapy. (Fischer et al. 2003; De Vita et al. and Rosenberg 2008)

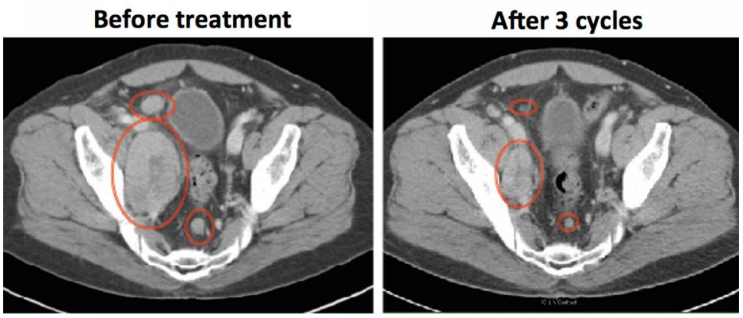

Figure [2-13]: show hormonal therapy, these abdominal CT scans of a man with prostate cancer show that injections of testosterone reduced the size of metastatic tumors (red circles). (http://www.sciencemag.org/news/2015/01/cancer-paradox-testosterone-injections-combat-lethal-prostate-tumors)

2:8:7 Stem Cell Transplant:

Stem cell transplants are procedures that restore blood-forming stem cells in people who have had theirs destroyed by the very high doses of chemotherapy or radiation therapy that are used to treat certain cancers.

Blood-forming stem cells are important because they grow into different types of blood cells. The main types of blood cells are; White blood cells [part of your

immune system], Red blood cells, [carry oxygen throughout your body], Platelets [which help the blood clot].The blood-forming stem cells that are used in transplants can come from the bone marrow, bloodstream, or umbilical cord. (The National Cancer Institute, 2015)

Stem Cell Transplant work: in a stem cell transplant, the patient receive healthy blood-forming stem cells through a needle in vein. Once they enter your bloodstream, the stem cells travel to the bone marrow, where they take the place of the cells that were destroyed by treatment. Stem cell transplants do not usually work against cancer directly. Instead, they help ability to produce stem cells after treatment with very high doses of radiation therapy, chemotherapy, or both. However, in multiple myeloma and some types of leukemia, the stem cell transplant may work against cancer directly, this happens because of an effect called graft-versus-tumor that can occur after allogeneic transplants. Graft-versus-tumor occurs when white blood cells from the donor (the graft) attack any cancer cells that remain in the body (the tumor) after high-dose treatments. This effect improves the success of the treatments. (The National Cancer Institute, 2015)

2:8:8 precision Medicine or Personalized Medicine:

In cancer, personalized medicine uses specific information about a person's tumor to help diagnose, plan treatment, work well treatment, or make a prognosis.

It an approach to patient care that allows doctors to select treatments that are most likely to help patients based on a genetic understanding of their disease. Genetic Changes in Cancer Are Identified by A biopsy, which is a procedure in which doctor remove a sample of the cancer. This sample will be sent to a special lab, where a machine called a DNA sequencer looks for genetic changes that may be causing the cancer to grow. The process of looking for genetic changes in cancer may be called DNA sequencing, genomic testing, molecular profiling, or tumor

profiling. Though precision medicine can become an additional option for people with cancer, it is not likely to replace the cancer treatments we already have. (The National Cancer Institute, 2015)

2:9 **Side Effects of Cancer Treatment:**

Cancer treatments can cause side effects—problems that occur when treatment affects healthy tissues or organs. Side effects vary from person to person, even among those receiving the same treatment. Some people have very few side effects while others have many. The type of treatment(s) receive, as well as the amount or frequency of the treatment, age, and other health conditions have may also factor into the side effects. (The National Cancer Institute, 2015)

Common side effects caused by cancer treatment include: Anemia, Appetite Loss, Bleeding and Bruising, Constipation, Diarrhea, Edema, Fatigue, Hair Loss (Alopecia), Infection and Neutropenia, Lymphedema, Memory or Concentration Problems, Mouth and Throat Problems, Nausea and Vomiting, Nerve Problems (Peripheral Neuropathy), Pain, Sexual and Fertility Problems (Men) and women, Skin and Nail Changes, Sleep Problems, Urinary and Bladder Problems. (The National Cancer Institute, 2015)

2:10 Cancer Prevention: defined as active measures to decrease the risk of cancer. The vast majority of cancer cases are due to environmental risk factors, and many, but not all, of these environmental factors are controllable lifestyle choices. Thus, cancer is a largely preventable disease.

Greater than 30% of cancer deaths could be prevented by avoiding risk factor including: tobacco, overweight or obesity an insufficient diet, physical inactivity, alcohol, sexually transmitted infections, and air pollution, not all environmental causes are controllable, such as naturally occurring background

radiation, and hereditary genetic disorders, the age; and thus it is not possible to prevent all cases of cancer.

There is more ways to prevent cancer:

2:10:1 Dietary: Dietary recommendations for cancer prevention typically include an emphasis on vegetables, fruit, whole grains, and fish, and an avoidance of processed and red meat (beef, pork, and lamb), animal fats, and refined carbohydrates. (En.Wikipedia.Org, 2017)

2:10:2 Medications: can used to prevent cancer include NSAIDs reduce the risk of colorectal cancer however due to the cardiovascular Aspirin has found to reduce the risk of death from cancer by about 7%. COX-2 inhibitor may decrease the rate of polyp formation in people with familial adenomatous polyposis however are associated with the same adverse effects as NSAIDs. Daily use of Tamoxifen or Raloxifene demonstrated to reduce the risk of developing breast cancer in high-risk women.

2:10:3Vaccination:Vaccines prevent infection by some carcinogenic viruses. Human papillomavirus vaccine (Gardasil and Cervix) decreases the risk of developing cervical cancer. The vaccine prevents infection with hepatitis B virus and thus decrease the risk of liver cancer. (En.Wikipedia.Org, 2017)

2:11 Previous Studies:

2:11:1 Study done by National Cancer Institute, **The Incidence of Cancer in The United States In 2016**, an estimated 1,685,210 new cases of cancer will diagnosed in the United States and 595,690 people will die from the disease.

They projected to be breast cancer, lung and bronchus cancer, prostate cancer, colon and rectum cancer, bladder cancer, melanoma of the skin, non-Hodgkin lymphoma, thyroid cancer, kidney and renal pelvis cancer, leukemia, endometrial cancer, and pancreatic cancer. (The National Cancer Institute, 2017)

In the period of 2008-2012 Studies show The number of new cases of cancer (cancer incidence) is 454.8 per 100,000 men and women per year and .The number of cancer deaths (cancer mortality) is 171.2 per 100,000 men and women per year. Cancer mortality is higher among men than women (207.9 per 100,000 men and 145.4 per 100,000 women). It is highest in African American men (261.5 per 100,000) and lowest in Asian/Pacific Islander women (91.2 per 100,000). Approximately 39.6 percent of men and women will be diagnosed with cancer at some point during their lifetimes (based on 2010-2012 data). In 2014, an estimated 15,780 children and adolescents ages 0 to 19 diagnosed with cancer and 1,960 died of the disease.

In addition, the number of people living beyond a cancer diagnosis reached nearly 14.5 million and increase to rise to almost 19 million by 2024. (The National Cancer Institute, 2017)

2:11:2 The Incidence of Cancer Worldwide: the WHO studies shows Cancer is among the leading causes of death worldwide. In 2012, there were 14 million new cases and 8.2 million cancer-related deaths worldwide, and the number of new cancer cases will rise to 22 million within the next two decades (about 70%). More than 60% of world's total new annual cases occur in Africa, Asia and Central and South America. These regions account for 70% of the world's cancer deaths. (Martel et al., 2008)

Among men, the 5 most common sites of cancer diagnosed in 2012 were lung, prostate, colorectal, stomach, and liver cancer and among women the five most

common sites diagnosed were breast, colorectal, lung, cervix, and stomach cancer. Around one third of cancer deaths are due to the five leading behavioral and dietary risks: high body mass index, low fruit and vegetable intake, lack of physical activity, tobacco use, alcohol use. Tobacco use is the most important risk factor for cancer causing around 20% of global cancer deaths and around 70% of global lung cancer deaths. Cancer causing viral infections such as HBV/HCV and HPV are responsible for up to 20% of cancer deaths in low- and middle-income countries. (Martel et al., 2008)

2:11:3 Table Gives Overviews of New Cases of Specific Cancer Globally and in Norway in 2012: (Qureshi, 2014)

Table [2-4]: Number of new cases of specific cancers in the world and in Norway in 2012

Cancer	World	Norway
Lung	**1,800,000**	**2,902**
Breast	**1,700,000**	**2,984**
Colorectal	**1,400,000**	**4,021**
Prostate	**1,100,000**	**4,919**
Stomach	**952,000**	**470**
Cervix	**529,800**	**330**
Liver	**782,451**	**215**

2:11:4 Cancer Incidence in Khartoum, Sudan: first results from the Cancer Registry, 2009–2010shows 6771 incident cases of cancer were recorded among

Khartoum residents in 2009–2010. Among them, 3125 (46.2%) were men and 3646 (53.8%) were women. Of those who had information on age at diagnosis (N = 6711), 486 (7.2%) were children aged less than 15 years, 319 (4.8%) were between 15 and 24 years, 2849 (42.5%) were between 25 and 54, 1227 (18.3%) were between 55 and 64, and 1830 (27.3%) were 65 years and older. (Saeed et al., 2010)

Top 10 most common primary cancer sites in Khartoum. Among all registered cancer cases with available information (N = 6548, 96.7%), breast cancer was the most common cancer, followed by leukemia, lymphoma, prostate cancer, colorectal cancer, oral cancer, cancer of esophagus, liver cancer, stomach cancer, and cancer of cervix. These cancers together made up 68.9% of all reported primary cancer sites during 2009–2010.

In women, of the 3646 cases, breast cancer was the most common cancer, followed by leukemia, cancer of the cervix, cancer of the ovary, lymphoma, cancer of esophagus, and colorectal cancer. In men, of 3125 cases, prostate cancer was the most common cancer, followed by leukemia, lymphoma, oral cancer, colorectal cancer, and cancer of the liver. In the children, of 486 cases, The top 10 most common cancer sites in children younger than 15 years Leukemia, lymphoma , eye, bone, kidney, brain, breast, oral, liver, stomach. (Saeed et al., 2010)

Chapter Three

Materials and Methods

3:1 Materials:

3:1:1 Study Sample: Total samples of 600 patient were included in the study, the age range between (4-93) years 283 of patient were males and 317 were females, the age average of 55 years. Most patient diagnosed with cancer.

3:1:2 Area and Duration of The Study: The study carried out during the period between (2014-2015) in Radiation and Isotopes Center (RICK).

3:1:3 Type of The Study: Is the statistical study.

3:2 Methods:

3:2:1 Method of Data Collection: A questionnaire was designed and the pts. Genders and ages, the site of cancer, the type of treatment and diagnosis, cancer symptoms and signs were collected and registered in data collection sheet.

3:2:2 Method of Data Analysis: The data was analyzed using Excel program and SPSS version 16 for significances of T tests were used. The data was presented at figures and tables .and the Correlations are significant at P=0.05.

3:2:3 Method of Data Interpretation: These data specifically assessed based on general cancer types versus certain criteria such as:

- Age which include age classes from (0-10) to (>70).
- Gender which include male and female.
- Symptoms which include pain, chest pain, lower limp pain, neck and back pain, ear pain and headache, epigastric pain, rectal bleeding, vaginal bleeding, postmenopausal bleeding, breast swelling, facial swelling, mouth sore, skin change, frequent urination.

- Diagnosis which include Biopsy, Biopsy with endoscopy, CT Scan with MRI or US Scan, CT Scan, US Scan, CT Scan with endoscopy.
- Treatment which include Chemotherapy, Both chemoradiotherapy, Radiotherapy, Surgery with Chemotherapy, Surgery, Surgery with Radiotherapy, Surgery with Both Chemoradiotherapy, Chemotherapy with Hormonal therapy, Immunotherapy(BCG).

Chapter Four

Results

The following tables and figures presented the statistical data obtained from 600 patients was coming to Radiation and Isotopes Center (RICK) during period between (2014-2015).

Table (4-1): Distribution of study sample according to Participant's Gender

Gender	Frequency	Percent (%)
Male	283	47.2
Female	317	52.8
Total	***600***	***100.0%***

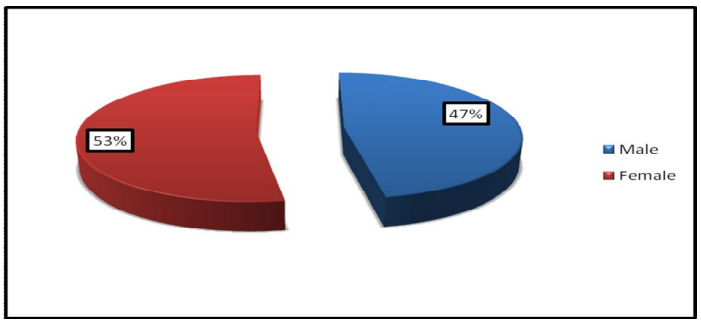

Figure (4-1): Distribution of study sample according to Participant's Gender

Table (4-2): Distribution of study sample according to Participant's age

Age classes	Frequency	Percent (%)
<10	4	.7
11-20	23	3.8
21-30	28	4.7
31-40	66	11.0
41-50	117	19.5
51-60	131	21.8
61-70	143	23.8
>70	88	14.7
Total	***600***	***100.0%***

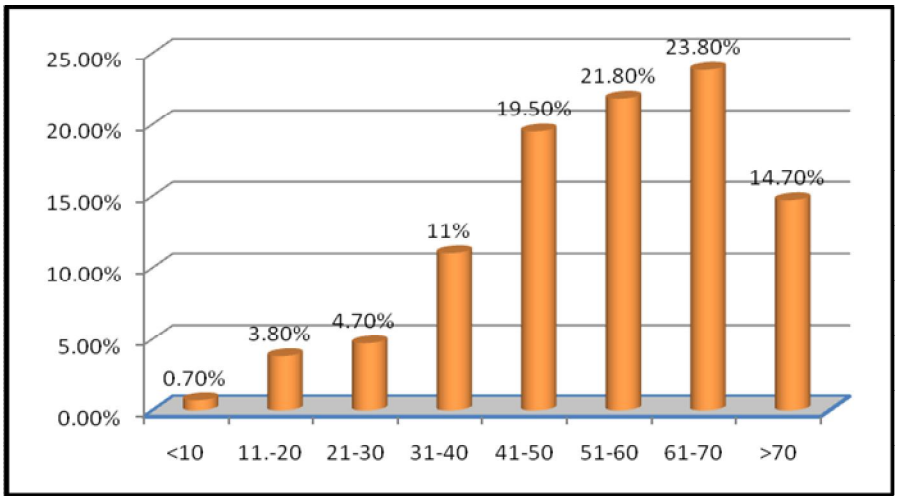

Figure (4-2): Distribution of study sample according to Participant's age

Table (4-3): Age Statistics

Mean	54.5883
Std. Deviation	16.95143
Minimum	4.00
Maximum	93.00

Table (4-4): Distribution of study sample according to Participant's Site

Site of cancer	Frequency	Percent (%)
Breast	78	13
Lung	49	8.2
Ovary	45	7.5
Mouth	45	7.5
Liver	41	6.8
Prostate	35	5.8
Nasopharynx	31	5.2
NHL	31	5.2
Cervix	28	4.7
Endometrium	27	4.5
Stomach	27	4.5
Skin	21	3.5
Bladder	17	2.8
Thyroid gland	16	2.7
Brain	16	2.7
Bone	16	2.7
Larynx	14	2.3

Rectum	14	2.3
Esophagus	14	2.3
Pancreas	13	2.2
SCC	10	1.7
Kidney	9	1.5
Anal canal	2	0.3
CLL	1	0.2
Total	***600***	***100.0%***

CLL= Chronic Lymphocytic Leukemia, NHL= Non-Hodgkin Lymphoma, SCC= Squamous Cell Carcinoma

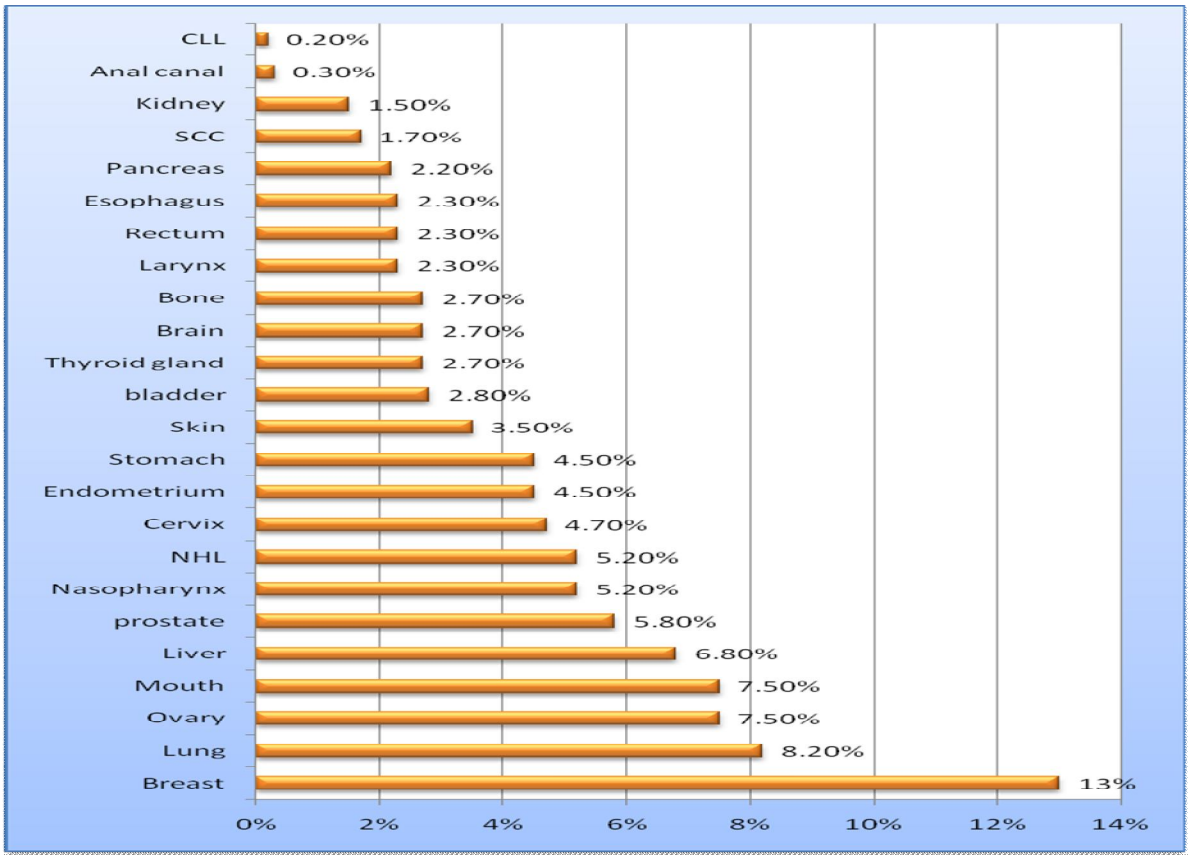

Figure (4-3): Distribution of study sample according to Participant's Site

Table (4-5): Distribution of study sample according to Participant's Treatment

Treatment	Frequency	Percent (%)
Chemotherapy	283	47.2
Both chemoradiotherapy	102	17
Radiotherapy	93	15.5
Surgery with Chemotherapy	48	8
Surgery	33	5.5
Surgery with Radiotherapy	21	3.5
Surgery with Both Chemoradiotherapy	14	2.3
Chemotherapy with Hormonal therapy	4	0.7
Immunotherapy(BCG)	2	0.3
Total	***600***	***100.0%***

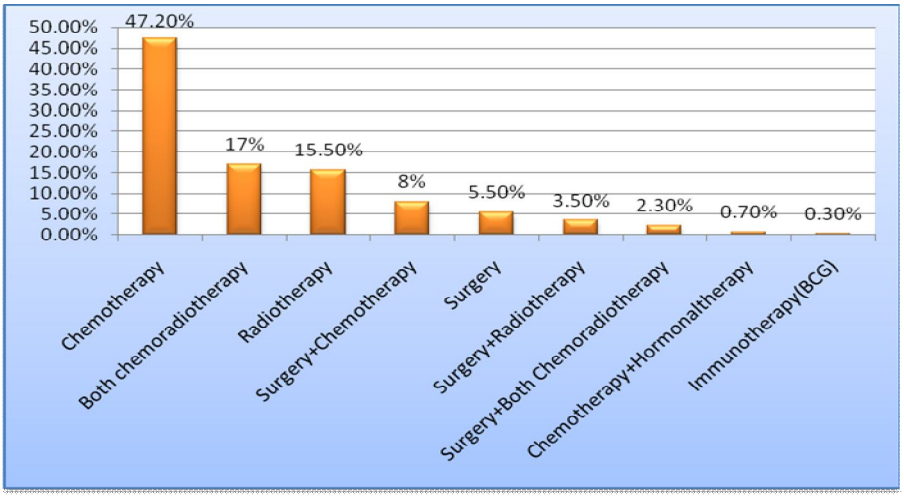

Figure (4-4): Distribution of study sample according to Participant's Treatment

Table (4-6): Distribution of study sample according to Participant's Diagnose

Diagnose	Frequency	Percent (%)
CT Scan	83	13.8
CT Scan with MRI or US Scan	38	6.3
Biopsy	335	55.8
Biopsy with endoscopy	31	5.2
US scan	96	16.0
CT Scan with endoscopy	17	2.8
Total	***600***	***100.0%***

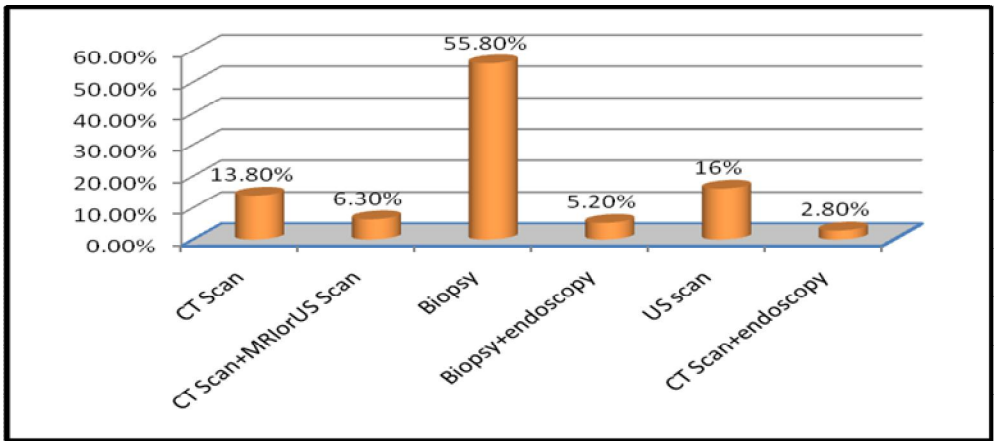

Figure (4-5): Distribution of study sample according to Participant's Diagnose

Table (4-7): Distribution of study sample according to Participant's Symptoms

Symptom	Frequency	Percent (%)
Pain	205	34.2
Breast swelling	61	10.2
Neck and back pain	75	12.5
Vaginal bleeding	26	4.3
Ear pain and headache	24	4.0
Chest pain"	56	9.3
Mouth sore	22	3.7
Rectal bleeding	12	2.0
Epigastric pain	27	4.5
Facial swelling	12	2.0
Frequent urination	18	3.0
Lower limp pain	51	8.5
post menopausal bleeding	4	.7
Skin change	7	1.2
Total	***600***	***100.0%***

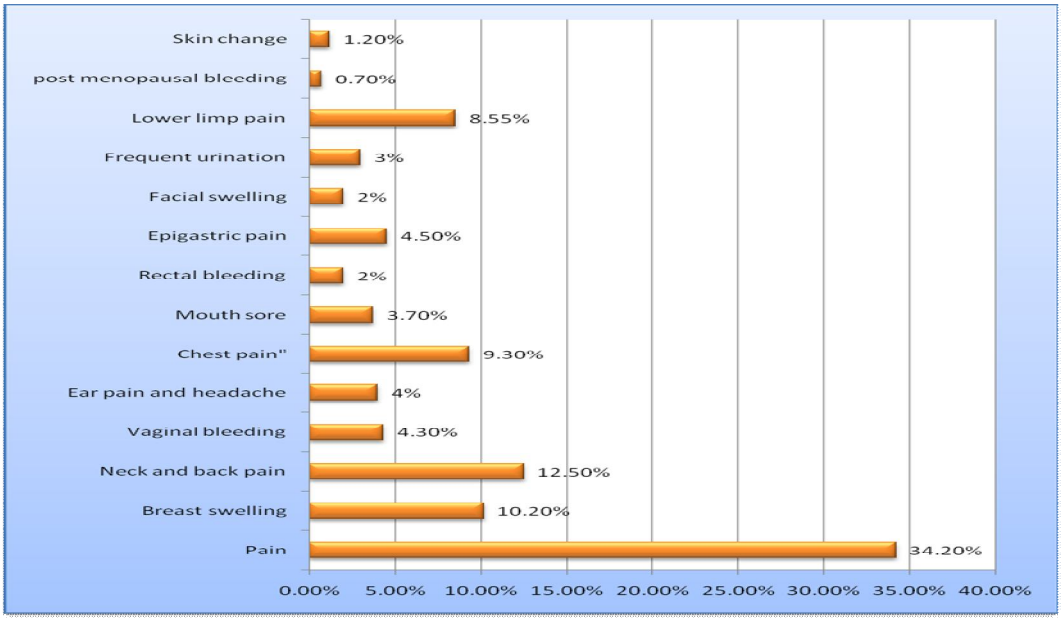

Figure (4-6): Distribution of study sample according to Participant's Symptom

Table (4-8): Cross Tabulation between Site of Cancer and Gender

Site Cross tabulated Gender			Gender		Total
			Male	Female	
Site	Breast	Count	5	73	78
		% of Total	.8%	12.2%	13.0%
	Ovary	Count	0	45	45
		% of Total	.0%	7.5%	7.5%
	Prostate	Count	33	2	35
		% of Total	5.5%	.3%	5.8%
	Nasopharynx	Count	17	14	31
		% of Total	2.8%	2.3%	5.2%
	Lung	Count	37	12	49
		% of Total	6.2%	2.0%	8.2%
	Larynx	Count	13	1	14
		% of Total	2.2%	.2%	2.3%
	NHL	Count	17	14	31
		% of Total	2.8%	2.3%	5.2%
	Thyroid gland	Count	6	10	16
		% of Total	1.0%	1.7%	2.7%
	Pancreas	Count	11	2	13
		% of Total	1.8%	.3%	2.2%
	Mouth	Count	25	20	45
		% of Total	4.2%	3.3%	7.5%
	SCC	Count	4	6	10
		% of Total	.7%	1.0%	1.7%
	Liver	Count	24	17	41
		% of Total	4.0%	2.8%	6.8%
	Endometrium	Count	1	26	27
		% of Total	.2%	4.3%	4.5%
	Stomach	Count	17	10	27
		% of Total	2.8%	1.7%	4.5%
	Anal canal	Count	2	0	2
		% of Total	.3%	.0%	.3%
	Cervix	Count	5	23	28
		% of Total	.8%	3.8%	4.7%
	Rectum	Count	10	4	14
		% of Total	1.7%	.7%	2.3%
	CLL	Count	0	1	1
		% of Total	.0%	.2%	.2%
	Esophagus	Count	4	10	14
		% of Total	.7%	1.7%	2.3%
	Bladder	Count	13	4	17
		% of Total	2.2%	.7%	2.8%
	Skin	Count	14	7	21
		% of Total	2.3%	1.2%	3.5%
	Kidney	Count	4	5	9
		% of Total	.7%	.8%	1.5%
	Brain	Count	8	8	16
		% of Total	1.3%	1.3%	2.7%
	Bone	Count	13	3	16
		% of Total	2.2%	.5%	2.7%
Total		Count	283	317	600
		% of Total	47.2%	52.8%	100.0%

P-value=0.00

Table (4-9): Cross Tabulation between Site of Cancer and Treatment

Site cross tabulated treatment			Treatment									Total
			Both chemoradiotherapy	Radiotherapy	Chemotherapy	Surgery	Surgery with Chemotherapy	Surgery with Radiotherapy	Surgery with Both Chemoradiotherapy	Chemotherapy with Hormonal therapy	Immunotherapy(BCG)	
Site	Breast	Count	9	17	32	5	10	3	2	0	0	**78**
		% of Total	1.5%	2.8%	5.3%	.8%	1.7%	.5%	.3%	.0%	.0%	**13.0%**
	Ovary	Count	8	5	25	2	2	1	0	1	1	**45**
		% of Total	1.3%	.8%	4.2%	.3%	.3%	.2%	.0%	.2%	.2%	**7.5%**
	Prostate	Count	5	5	16	2	5	0	2	0	0	**35**
		% of Total	.8%	.8%	2.7%	.3%	.8%	.0%	.3%	.0%	.0%	**5.8%**
	Nasopharynx	Count	7	2	16	2	3	1	0	0	0	**31**
		% of Total	1.2%	.3%	2.7%	.3%	.5%	.2%	.0%	.0%	.0%	**5.2%**
	Lung	Count	8	6	26	3	5	0	1	0	0	**49**
		% of Total	1.3%	1.0%	4.3%	.5%	.8%	.0%	.2%	.0%	.0%	**8.2%**
	Larynx	Count	4	3	3	0	1	3	0	0	0	**14**
		% of Total	.7%	.5%	.5%	.0%	.2%	.5%	.0%	.0%	.0%	**2.3%**
	NHL	Count	4	9	13	1	2	1	1	0	0	**31**
		% of Total	.7%	1.5%	2.2%	.2%	.3%	.2%	.2%	.0%	.0%	**5.2%**
	Thyroid gland	Count	1	1	9	2	2	0	1	0	0	**16**
		% of Total	.2%	.2%	1.5%	.3%	.3%	.0%	.2%	.0%	.0%	**2.7%**
	Pancreas	Count	3	1	7	1	0	1	0	0	0	**13**
		% of Total	.5%	.2%	1.2%	.2%	.0%	.2%	.0%	.0%	.0%	**2.2%**
	Mouth	Count	6	8	22	4	3	1	0	1	0	**45**
		% of Total	1.0%	1.3%	3.7%	.7%	.5%	.2%	.0%	.2%	.0%	**7.5%**
	SCC	Count	1	2	4	1	2	0	0	0	0	**10**
		% of Total	.2%	.3%	.7%	.2%	.3%	.0%	.0%	.0%	.0%	**1.7%**
	Liver	Count	8	5	24	1	1	0	2	0	0	**41**
		% of Total	1.3%	.8%	4.0%	.2%	.2%	.0%	.3%	.0%	.0%	**6.8%**
	Endometrium	Count	5	7	11	2	1	0	0	1	0	**27**
		% of Total	.8%	1.2%	1.8%	.3%	.2%	.0%	.0%	.2%	.0%	**4.5%**
	Stomach	Count	6	1	13	1	4	1	1	0	0	**27**
		% of Total	1.0%	.2%	2.2%	.2%	.7%	.2%	.2%	.0%	.0%	**4.5%**
	Anal	Count	1	0	1	0	0	0	0	0	0	**2**

	canal	% of Total	.2%	.0%	.2%	.0%	.0%	.0%	.0%	.0%	.0%	**.3%**
	Cervix	Count	7	10	6	0	1	1	2	1	0	**28**
		% of Total	1.2 %	1.7%	1.0%	.0%	.2%	.2%	.3%	.2%	.0%	**4.7%**
	Rectum	Count	3	0	10	1	0	0	0	0	0	**14**
		% of Total	.5%	.0%	1.7%	.2%	.0%	.0%	.0%	.0%	.0%	**2.3%**
	CLL	Count	0	0	1	0	0	0	0	0	0	**1**
		% of Total	.0%	.0%	.2%	.0%	.0%	.0%	.0%	.0%	.0%	**.2%**
	Esophagus	Count	2	6	4	1	1	0	0	0	0	**14**
		% of Total	.3%	1.0%	.7%	.2%	.2%	.0%	.0%	.0%	.0%	**2.3%**
	Bladder	Count	4	1	8	0	2	2	0	0	0	**17**
		% of Total	.7%	.2%	1.3%	.0%	.3%	.3%	.0%	.0%	.0%	**2.8%**
	Skin	Count	5	1	10	1	0	2	1	0	1	**21**
		% of Total	.8%	.2%	1.7%	.2%	.0%	.3%	.2%	.0%	.2%	**3.5%**
	Kidney	Count	1	2	5	1	0	0	0	0	0	**9**
		% of Total	.2%	.3%	.8%	.2%	.0%	.0%	.0%	.0%	.0%	**1.5%**
	Brain	Count	1	0	9	1	2	2	1	0	0	**16**
		% of Total	.2%	.0%	1.5%	.2%	.3%	.3%	.2%	.0%	.0%	**2.7%**
	Bone	Count	3	1	8	1	1	2	0	0	0	**16**
		% of Total	.5%	.2%	1.3%	.2%	.2%	.3%	.0%	.0%	.0%	**2.7%**
Total		Count	102	93	283	33	48	21	14	4	2	**600**
		% of Total	17.0 %	15.5%	47.2%	5.5%	8.0%	3.5%	2.3%	.7%	.3%	**100.0%**

P-value= 0.755

CLL= Chronic Lymphocytic Leukemia

NHL= Non-Hodgkin Lymphoma

SCC= Squamous Cell Carcinoma

Table (4-10): Cross Tabulation between Site of Cancer and Diagnose

Site Cross tabulated Diagnose			Diagnose						Total
			CT Scan	CT Scan with MRI or US Scan	Biopsy	Biopsy with endoscopy	US scan	CT Scan with endoscopy	
Site	Breast	Count	4	7	51	0	16	0	**78**
		% of Total	.7%	1.2%	8.5%	.0%	2.7%	.0%	**13.0%**
	Ovary	Count	9	9	24	0	3	0	**45**
		% of Total	1.5%	1.5%	4.0%	.0%	.5%	.0%	**7.5%**
	Prostate	Count	5	2	12	2	13	1	**35**
		% of Total	.8%	.3%	2.0%	.3%	2.2%	.2%	**5.8%**
	Nasopharynx	Count	1	2	22	5	1	0	**31**
		% of Total	.2%	.3%	3.7%	.8%	.2%	.0%	**5.2%**
	Lung	Count	12	3	21	4	6	3	**49**
		% of Total	2.0%	.5%	3.5%	.7%	1.0%	.5%	**8.2%**
	Larynx	Count	1	0	12	1	0	0	**14**
		% of Total	.2%	.0%	2.0%	.2%	.0%	.0%	**2.3%**
	NHL	Count	3	1	24	0	2	1	**31**
		% of Total	.5%	.2%	4.0%	.0%	.3%	.2%	**5.2%**
	Thyroid gland	Count	2	0	6	1	7	0	**16**
		% of Total	.3%	.0%	1.0%	.2%	1.2%	.0%	**2.7%**
	Pancreas	Count	4	2	3	1	2	1	**13**
		% of Total	.7%	.3%	.5%	.2%	.3%	.2%	**2.2%**
	Mouth	Count	7	1	27	2	8	0	**45**
		% of Total	1.2%	.2%	4.5%	.3%	1.3%	.0%	**7.5%**
	SCC	Count	2	0	7	0	1	0	**10**
		% of Total	.3%	.0%	1.2%	.0%	.2%	.0%	**1.7%**
	Liver	Count	11	3	19	1	6	1	**41**
		% of Total	1.8%	.5%	3.2%	.2%	1.0%	.2%	**6.8%**
	Endometrium	Count	2	0	20	0	5	0	**27**
		% of Total	.3%	.0%	3.3%	.0%	.8%	.0%	**4.5%**
	Stomach	Count	3	2	13	4	2	3	**27**
		% of Total	.5%	.3%	2.2%	.7%	.3%	.5%	**4.5%**
	Anal canal	Count	0	0	1	0	0	1	**2**
		% of Total	.0%	.0%	.2%	.0%	.0%	.2%	**.3%**
	Cervix	Count	4	0	18	2	1	3	**28**
		% of Total	.7%	.0%	3.0%	.3%	.2%	.5%	**4.7%**
	Rectum	Count	2	1	3	3	4	1	**14**
		% of Total	.3%	.2%	.5%	.5%	.7%	.2%	**2.3%**
	CLL	Count	0	0	1	0	0	0	**1**
		% of Total	.0%	.0%	.2%	.0%	.0%	.0%	**.2%**
	Esophagus	Count	3	2	7	1	1	0	**14**
		% of Total	.5%	.3%	1.2%	.2%	.2%	.0%	**2.3%**
	Bladder	Count	3	1	8	2	2	1	**17**
		% of Total	.5%	.2%	1.3%	.3%	.3%	.2%	**2.8%**
	Skin	Count	1	0	13	1	5	1	**21**
		% of Total	.2%	.0%	2.2%	.2%	.8%	.2%	**3.5%**
	Kidney	Count	0	1	6	1	1	0	**9**
		% of Total	.0%	.2%	1.0%	.2%	.2%	.0%	**1.5%**
	Brain	Count	1	1	7	0	7	0	**16**
		% of Total	.2%	.2%	1.2%	.0%	1.2%	.0%	**2.7%**
	Bone	Count	3	0	10	0	3	0	**16**
		% of Total	.5%	.0%	1.7%	.0%	.5%	.0%	**2.7%**
Total		Count	83	38	335	31	96	17	**600**
		% of Total	13.8%	6.3%	55.8%	5.2%	16.0%	2.8%	**100.0%**

P-value=0.000

Table (4-11): Cross Tabulation between Site of Cancer and Symptoms

Site cross tabulated symptom			Symptoms														Total
			Pain	breast swelling	neck and back pain	vaginal bleeding	ear pain and headache	chest pain"	mouth sore	rectal bleeding	epigastric pain	facial swelling	frequent urination	lower limp pain	post-menopausal bleeding	skin change	
Site	Breast	Count	26	11	8	4	3	10	3	1	1	2	2	4	2	1	**78**
		% of Total	4.3%	1.8%	1.3%	.7%	.5%	1.7%	.5%	.2%	.2%	.3%	.3%	.7%	.3%	.2%	**13.0%**
	Ovary	Count	17	4	9	3	2	0	2	1	1	1	0	5	0	0	**45**
		% of Total	2.8%	.7%	1.5%	.5%	.3%	.0%	.3%	.2%	.2%	.2%	.0%	.8%	.0%	.0%	**7.5%**
	Prostate	Count	12	4	5	4	0	3	2	0	0	1	1	2	0	1	**35**
		% of Total	2.0%	.7%	.8%	.7%	.0%	.5%	.3%	.0%	.0%	.2%	.2%	.3%	.0%	.2%	**5.8%**
	Nasopharynx	Count	9	2	5	0	0	2	2	2	3	2	1	2	0	1	**31**
		% of Total	1.5%	.3%	.8%	.0%	.0%	.3%	.3%	.3%	.5%	.3%	.2%	.3%	.0%	.2%	**5.2%**
	Lung	Count	12	6	5	1	4	5	1	2	3	1	1	6	2	0	**49**
		% of Total	2.0%	1.0%	.8%	.2%	.7%	.8%	.2%	.3%	.5%	.2%	.2%	1.0%	.3%	.0%	**8.2%**
	Larynx	Count	5	0	2	1	2	1	1	1	0	0	0	1	0	0	**14**
		% of Total	.8%	.0%	.3%	.2%	.3%	.2%	.2%	.2%	.0%	.0%	.0%	.2%	.0%	.0%	**2.3%**
	NHL	Count	9	2	5	0	0	4	1	1	2	0	1	4	0	2	**31**
		% of Total	1.5%	.3%	.8%	.0%	.0%	.7%	.2%	.2%	.3%	.0%	.2%	.7%	.0%	.3%	**5.2%**
	Thyroid gland	Count	3	4	4	0	0	2	0	1	0	0	0	2	0	0	**16**
		% of Total	.5%	.7%	.7%	.0%	.0%	.3%	.0%	.2%	.0%	.0%	.0%	.3%	.0%	.0%	**2.7%**
	Pancreas	Count	5	0	2	0	1	3	0	0	1	0	0	1	0	0	**13**
		% of Total	.8%	.0%	.3%	.0%	.2%	.5%	.0%	.0%	.2%	.0%	.0%	.2%	.0%	.0%	**2.2%**
	Mouth	Count	12	2	7	3	1	4	3	1	2	0	2	7	0	1	**45**
		% of Total	2.0%	.3%	1.2%	.5%	.2%	.7%	.5%	.2%	.3%	.0%	.3%	1.2%	.0%	.2%	**7.5%**
	SCC	Count	3	2	0	0	0	3	0	0	0	1	0	1	0	0	**10**
		% of Total	.5%	.3%	.0%	.0%	.0%	.5%	.0%	.0%	.0%	.2%	.0%	.2%	.0%	.0%	**1.7%**
	Liver	Count	15	2	5	0	3	4	4	1	2	0	0	5	0	0	**41**
		% of Total	2.5%	.3%	.8%	.0%	.5%	.7%	.7%	.2%	.3%	.0%	.0%	.8%	.0%	.0%	**6.8%**
	Endometrium	Count	13	1	3	2	1	1	1	1	1	1	1	1	0	0	**27**
		% of Total	2.2%	.2%	.5%	.3%	.2%	.2%	.2%	.2%	.2%	.2%	.2%	.2%	.0%	.0%	**4.5%**
	Stomach	Count	16	2	2	0	1	1	0	0	1	1	2	1	0	0	**27**
		% of Total	2.7%	.3%	.3%	.0%	.2%	.2%	.0%	.0%	.2%	.2%	.3%	.2%	.0%	.0%	**4.5%**

	Anal canal	Count	1	0	0	0	0	1	0	0	0	0	0	0	0	0	**2**
		% of Total	.2 %	.0%	.0%	.0 %	.0%	.2%	.0 %	.0 %	.0%	.0%	.0 %	.0 %	.0%	.0 %	**.3%**
	Cervix	Count	6	4	4	3	1	3	0	0	2	0	1	3	0	1	**28**
		% of Total	1.0 %	.7%	.7%	.5 %	.2%	.5%	.0 %	.0 %	.3%	.0%	.2 %	.5 %	.0%	.2 %	**4.7%**
	Rectum	Count	4	3	2	0	1	1	0	0	0	0	2	1	0	0	**14**
		% of Total	.7 %	.5%	.3%	.0 %	.2%	.2%	.0 %	.0 %	.0%	.0%	.3 %	.2 %	.0%	.0 %	**2.3%**
	CLL	Count	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
		% of Total	.2 %	.0%	.0%	.0 %	.0%	.0%	.0 %	.0 %	.0%	.0%	.0 %	.0 %	.0%	.0 %	**.2%**
	Esophagus	Count	3	2	0	1	1	2	1	0	2	0	1	1	0	0	**14**
		% of Total	.5 %	.3%	.0%	.2 %	.2%	.3%	.2 %	.0 %	.3%	.0%	.2 %	.2 %	.0%	.0 %	**2.3%**
	bladder	Count	4	4	2	0	0	2	0	0	2	1	1	1	0	0	**17**
		% of Total	.7 %	.7%	.3%	.0 %	.0%	.3%	.0 %	.0 %	.3%	.2%	.2 %	.2 %	.0%	.0 %	**2.8%**
	Skin	Count	9	2	1	1	2	2	0	0	2	0	0	2	0	0	**21**
		% of Total	1.5 %	.3%	.2%	.2 %	.3%	.3%	.0 %	.0 %	.3%	.0%	.0 %	.3 %	.0%	.0 %	**3.5%**
	Kidney	Count	5	1	0	0	1	0	1	0	0	0	1	0	0	0	**9**
		% of Total	.8 %	.2%	.0%	.0 %	.2%	.0%	.2 %	.0 %	.0%	.0%	.2 %	.0 %	.0%	.0 %	**1.5%**
	Brain	Count	9	1	2	2	0	2	0	0	0	0	0	0	0	0	**16**
		% of Total	1.5 %	.2%	.3%	.3 %	.0%	.3%	.0 %	.0 %	.0%	.0%	.0 %	.0 %	.0%	.0 %	**2.7%**
	Bone	Count	6	2	2	1	0	0	0	0	2	1	1	1	0	0	**16**
		% of Total	1.0 %	.3%	.3%	.2 %	.0%	.0%	.0 %	.0 %	.3%	.2%	.2 %	.2 %	.0%	.0 %	**2.7%**
Total		Count	205	61	75	26	24	56	22	12	27	12	18	51	4	7	**600**
		% of Total	34.2%	10.2 %	12.5 %	4.3 %	4.0%	9.3%	3.7 %	2.0 %	4.5 %	2.0%	3.0 %	8.5 %	.7%	1.2 %	**100.0 %**

P-Value = 0. 997

CLL= Chronic Lymphocytic Leukemia

NHL= Non-Hodgkin Lymphoma

SCC= Squamous Cell Carcinoma

Table (4-12): Cross Tabulation between Site of Cancer and Age

Site Cross tabulated Age			Age								Total
			<10	11-20	21-30	31-40	41-50	51-60	61-70	>70	
Site	Breast	Count	0	1	2	11	24	22	12	6	**78**
		% of Total	.0%	.2%	.3%	1.8%	4.0%	3.7%	2.0%	1.0%	**13.0%**
	Ovary	Count	0	0	1	9	8	8	13	6	**45**
		% of Total	.0%	.0%	.2%	1.5%	1.3%	1.3%	2.2%	1.0%	**7.5%**
	prostate	Count	0	0	0	0	2	3	15	15	**35**
		% of Total	.0%	.0%	.0%	.0%	.3%	.5%	2.5%	2.5%	**5.8%**
	Nasopharynx	Count	0	5	5	6	6	2	5	2	**31**
		% of Total	.0%	.8%	.8%	1.0%	1.0%	.3%	.8%	.3%	**5.2%**
	Lung	Count	0	2	0	4	11	10	12	10	**49**
		% of Total	.0%	.3%	.0%	.7%	1.8%	1.7%	2.0%	1.7%	**8.2%**
	Larynx	Count	0	0	0	2	2	3	4	3	**14**
		% of Total	.0%	.0%	.0%	.3%	.3%	.5%	.7%	.5%	**2.3%**
	NHL	Count	0	1	0	4	8	8	5	5	**31**
		% of Total	.0%	.2%	.0%	.7%	1.3%	1.3%	.8%	.8%	**5.2%**
	Thyroid gland	Count	0	2	2	1	3	4	3	1	**16**
		% of Total	.0%	.3%	.3%	.2%	.5%	.7%	.5%	.2%	**2.7%**
	Pancreas	Count	0	0	0	1	1	2	6	3	**13**
		% of Total	.0%	.0%	.0%	.2%	.2%	.3%	1.0%	.5%	**2.2%**
	Mouth	Count	1	1	2	6	10	14	7	4	**45**
		% of Total	.2%	.2%	.3%	1.0%	1.7%	2.3%	1.2%	.7%	**7.5%**
	SCC	Count	0	0	1	3	3	2	1	0	**10**
		% of Total	.0%	.0%	.2%	.5%	.5%	.3%	.2%	.0%	**1.7%**
	Liver	Count	0	0	1	1	9	11	13	6	**41**
		% of Total	.0%	.0%	.2%	.2%	1.5%	1.8%	2.2%	1.0%	**6.8%**
	Endometrium	Count	0	0	6	2	5	5	8	1	**27**
		% of Total	.0%	.0%	1.0%	.3%	.8%	.8%	1.3%	.2%	**4.5%**
	Stomach	Count	0	0	0	3	5	7	7	5	**27**
		% of Total	.0%	.0%	.0%	.5%	.8%	1.2%	1.2%	.8%	**4.5%**
	Anal canal	Count	0	0	0	0	0	1	1	0	**2**
		% of Total	.0%	.0%	.0%	.0%	.0%	.2%	.2%	.0%	**.3%**
	Cervix	Count	0	0	1	2	3	11	7	4	**28**
		% of Total	.0%	.0%	.2%	.3%	.5%	1.8%	1.2%	.7%	**4.7%**

	Rectum	Count	0	0	0	2	2	5	3	2	**14**
		% of Total	.0%	.0%	.0%	.3%	.3%	.8%	.5%	.3%	**2.3%**
	CLL	Count	0	0	0	0	0	0	0	1	**1**
		% of Total	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.2%	**.2%**
	Esophagus	Count	0	2	0	3	0	2	5	2	**14**
		% of Total	.0%	.3%	.0%	.5%	.0%	.3%	.8%	.3%	**2.3%**
	bladder	Count	0	0	0	0	4	2	6	5	**17**
		% of Total	.0%	.0%	.0%	.0%	.7%	.3%	1.0%	.8%	**2.8%**
	Skin	Count	0	0	3	0	5	3	6	4	**21**
		% of Total	.0%	.0%	.5%	.0%	.8%	.5%	1.0%	.7%	**3.5%**
	Kidney	Count	0	0	1	2	2	2	2	0	**9**
		% of Total	.0%	.0%	.2%	.3%	.3%	.3%	.3%	.0%	**1.5%**
	Brain	Count	3	2	2	2	3	2	0	2	**16**
		% of Total	.5%	.3%	.3%	.3%	.5%	.3%	.0%	.3%	**2.7%**
	Bone	Count	0	7	1	2	1	2	2	1	**16**
		% of Total	.0%	1.2%	.2%	.3%	.2%	.3%	.3%	.2%	**2.7%**
Total		Count	4	23	28	66	117	131	143	88	**600**
		% of Total	.7%	3.8%	4.7%	11.0 %	19.5%	21.8 %	23.8%	14.7%	**100.0%**

P-value=0.000

CLL= Chronic Lymphocytic Leukemia

NHL= Non-Hodgkin Lymphoma

SCC= Squamous Cell Carcinoma

Chapter Five

(Discussion, Conclusions and Recommendation)

5:1 Discussion:

This study is attempting to study the common cancer frequency in Radiation and Isotopes Center (RICK) and to study the incidence of cancers according to age, gender, site of cancer, symptoms, diagnose treatment.

This study was performed on 600 patients. The data collected for patients age (4-93) years old. The results showed that the common cancer frequency were correlated with patient age, gender, site of cancer, symptoms, diagnose, treatment.

The study showed that females were (317) patients the percentage (52.8%) were more frequent than male were (283) patients the percentage (47.2%) as presented in **Table (4-1).**

These result compared to similar study done by (Saeed et al., 2010)

Cancer Incidence in Khartoum, Sudan: first results from the Cancer Registry, mention that Total of 6771 incident cases of cancer were recorded among Khartoum residents in 2009–2010. Among them, 3125 (46.2%) were men and 3646 (53.8%) were women.

In **Table (4-2)** and **(4-3)** the result found that, the most age group affected by cancer in patient were 391 (65.2%) in age classes between 41 and 70, 27 (4.5%) were alder patients aged less than 20 years also noted that mean ages (54.5883) and standard deviation (± 16.9513).

These result compared to different study done by (Saeed et al., 2010) Cancer Incidence in Khartoum, Sudan: first results from the Cancer Registry. Mention that of those who had information on age at diagnosis (*N* = 6711), 486 (7.2%) were children aged less than 15 years, 319 (4.8%) were between 15 and 24 years, 2849 (42.5%) were between 25 and 54, 1227 (18.3%) were between 55 and 64, and 1830 (27.3%) were 65 years and older.

In **Table (4-4)** the result found that the common cancer frequency in Patients were *Breast* cancer was (78) patient the percentage (13%), Then *Lung*, Ovary, Mouth, Liver, Prostate, Nasopharynx, NHL, Cervix, Endometrium. These cancers together made up (68.3%) of all reported cancer.

These result compared to different study done Cancer Incidence by (Saeed et al., 2010) in Khartoum, Sudan: first results from the Cancer Registry Mention that Top 10 most common primary cancer sites in Khartoum. Among all registered cancer cases with available information (*N* = 6548, 96.7%), *breast* cancer was the most common cancer, followed by *leukemia*, lymphoma, prostate cancer, colorectal cancer, oral cancer, cancer of esophagus, liver cancer, stomach cancer, and cancer of cervix. These cancers together made up (68.9%) of all reported primary cancer sites during 2009–2010.

In addition, the result compared to similar study done by (Torre, 2012) Global cancer statistics, in2012worldwide. Mention that**,** *Lung* and *breast* cancer are the most frequently diagnosed cancers and the leading causes of cancer death in men and women.

In **Table (4-5),** the result found that the chemotherapy was most common treatment options used for cancer treatment.

These result compared to similar study done by (Pentheroudakis, 2006) mention that 1372 patients with a median age of 70 years diagnosed with metastatic breast (n=250), colorectal (n=621) or lung cancer (n=501) received chemotherapy from 1991 until 2006. Most patients received modern full-dose chemotherapy and indicated to that relatively fit elderly patients with advanced cancer safely tolerate modern chemotherapy and enjoy disease control in a manner comparable to younger patients.

In **Table (4-6)** the result found that the most common diagnostic tools for cancer was Biopsy, which was (335) of patients (55.8%).

These result compared to similar study done by (Saeed et al., 2010) Cancer Incidence in Khartoum, Sudan: first results from the Cancer Registry, mention that the majority (59.83%) of the cases were microscopically verified (MV). Registrations were considered MV where diagnosis was based on malignant histological or cytological reports.

In **Table (4-7),** the result found the most common symptom related to cancers was pain. In addition, it formed (205) of 600 patients by the percentage (34.2%).

The result compared to different study done by (Guirimand et al., 2010), Cancer-Related Symptom Assessment in France. Studies show that Fatigue and distress were the highest scored symptoms, both having a mean value exceeding 3.00 on a 0–10 scale.

In **Table (4-8)** the result found that There is significant relationship between site of cancer and gender according to P-value=0.000. The most common cancer in men are lung cancer, prostate cancer, NHL, Nasopharynx, Larynx, Pancreas, Mouth, liver, Stomach, Anal canal, Rectum, Bladder, Skin, Bone,

Brain. In women are Breast cancer, Ovary cancer, Thyroid, SCC, Endometrium, Cervix, CLL, Esophagus, kidney, Brain.

The result compared to similar study done by (Saeed et al., 2010) Cancer Incidence in Khartoum, Sudan: first results from the Cancer Registry (2009–2010), mention that in women, of the 3646 cases, breast cancer was the most common cancer, followed by leukemia, cancer of the cervix**,** cancer of the ovary, lymphoma, cancer of esophagus, and colorectal cancer. In men, of 3125 cases, prostate cancer was the most common cancer, followed by leukemia, lymphoma, oral cancer, colorectal cancer, and cancer of the liver. In the children, of 486 cases, The top 10 most common cancer sites in children younger than 15 years Leukemia, lymphoma , eye, bone, kidney, brain, breast, oral, liver, stomach.

In **Table (4-9) t**he result found that there is no significant relationship between site of cancer and treatment option according to P-value=0.755 (breast cancer more treated by chemotherapy).

The result compared to similar study done by (Siegel et al., 2016) Cancer statistics in US cancer cases, show that Among women diagnosed with stage I or II breast cancer, 61% undergo BCS (with the majority also receiving additional therapy) and 36% undergo mastectomy (Fig. 4). A much smaller percentage of stage III patients undergo BCS (21%), whereas 72% undergo mastectomy. Women diagnosed with stage IV disease most often receive radiation and/or chemotherapy alone (48%). Among women with hormone-receptor positive breast cancer of any stage, 79% receive hormonal therapy. In **Table (4-10)** the result found that, There is significant relationship between site of cancer and diagnostic tool according to P-value=0.000.

The breast cancer, ovary, Nasopharynx, lung, larynx, NHL, mouth, SCC, liver, endometrium, stomach, cervix, CLL, esophagus, skin, bladder, kidney, bone were most diagnosed by biopsy. While prostate cancer, thyroid, rectum most diagnosed by US scan. The pancreas most diagnosed by CT scan.

According to The pancreas most diagnosed by CT scan, the result compared to similar study done by (Takhar, 2004) in the United Kingdom, show that Computed tomography is the current modality of choice for diagnostic and staging of pancreatic carcinoma.

In **Table (4-11)** the result found that, There is no significant relationship between site of cancer and symptoms according to P-value=0.997 (Brest caner more appear by pain).

The result compared to similar study done by (Montazeri et al., 2003) on Iranian women show that first symptom seen Lump was (167) of 190 patient by the frequency of (88%) and other symptoms including discharge, pain, and skin problems were (23) of 190 patient (12%).

In **Table (4-12)** result found that there is significant relationship between site of cancer and age according to P-value=0.000, so that the prostate cancer more observed in patients age from 60 years to above.

The result compared to similar study done by (Adeloye, 2016) To an Estimate of the Incidence of Prostate Cancer in Africa show that an increasing trend in Prostate cancer incidence with advancing age, and over the main years covered.

5:2 Conclusions:

The study conclude that 600 cases affected by cancer came to Radiation and Isotopes Center (RICK) during period between (2014-2015), conclusion of the result are as follows:

- The study show that female patients' frequency is more than males' frequency.
- The most age group affected by cancer in Patient were in age classes between 41 and 70 (were more than one-half of patients).
- The common cancer frequency in Radiation and Isotopes Center (RICK) were Breast cancer, Then Lung, Ovary, Mouth, Liver, Prostate, Nasopharynx, NHL, Cervix, and Endometrium.
- The most common treatment options for cancer was The chemotherapy
- The most common diagnostic tools for cancer was Biopsy.
- The most common symptom related to cancers was pain.
- There is significant relationship between site of cancer and gender according to P-value=0.000, so that common types of cancer in men were lung cancer followed by prostate cancer, and in women were breast cancer followed by ovary cancer.
- There is significant relationship between site of cancer and age according to P-value=0.000 so that the prostate cancer more observed in patients age from 60 years to above.
- There is no significant relationship between site of cancer and treatment option according to P-value=0.755 even though the breast cancer more treated by chemotherapy.

- There is significant relationship between site of cancer and diagnostic tool according to P-value=0.000 so that the pancreas most diagnosed by CT scan.
- There is no significant relationship between site of cancer and symptoms according to P-value=0.997 even though the most common symptom in breast cancer was pain.

5:3 Recommendation:

- Further study is needed for the incidence of cancers in Radiation and Isotopes Center (RICK) with larger sample of Sudanese population for more accurate results.
- Further study concentrates on in the incidence of breast cancer, Ovary, Lung, Prostate in Radiation and Isotopes Center (RICK) for more prevention from which.
- Further study is needed for the incidence of cancers in Radiation and Isotopes Center (RICK) is considered with cancer risk factor and hereditary factor.

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Appendix:

Data collecting sheet (questionnaire)

Patient NO	Patient Gender	Patient Age	Cancer Site	Cancer Symptoms	Diagnosis Type	Treatment Type